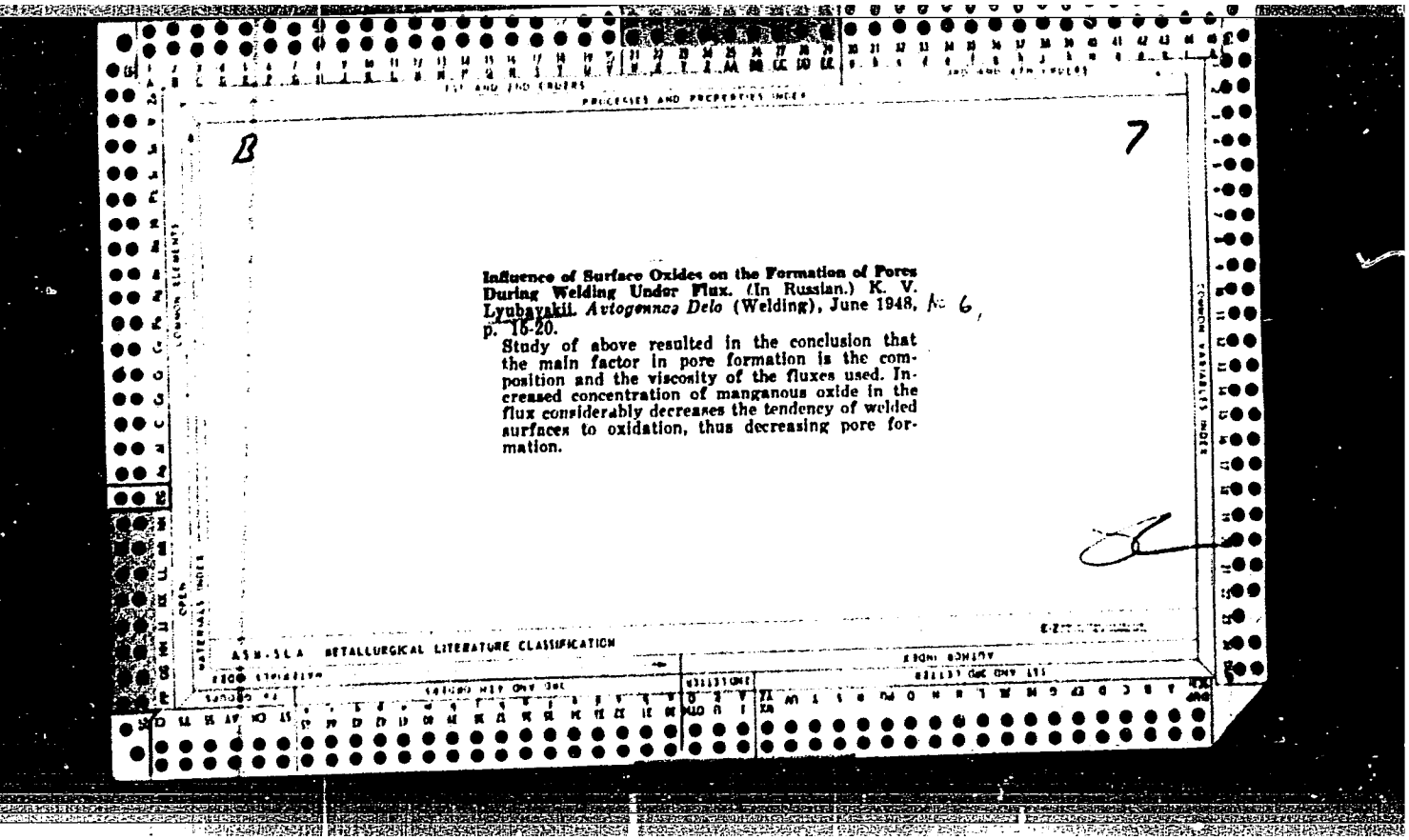


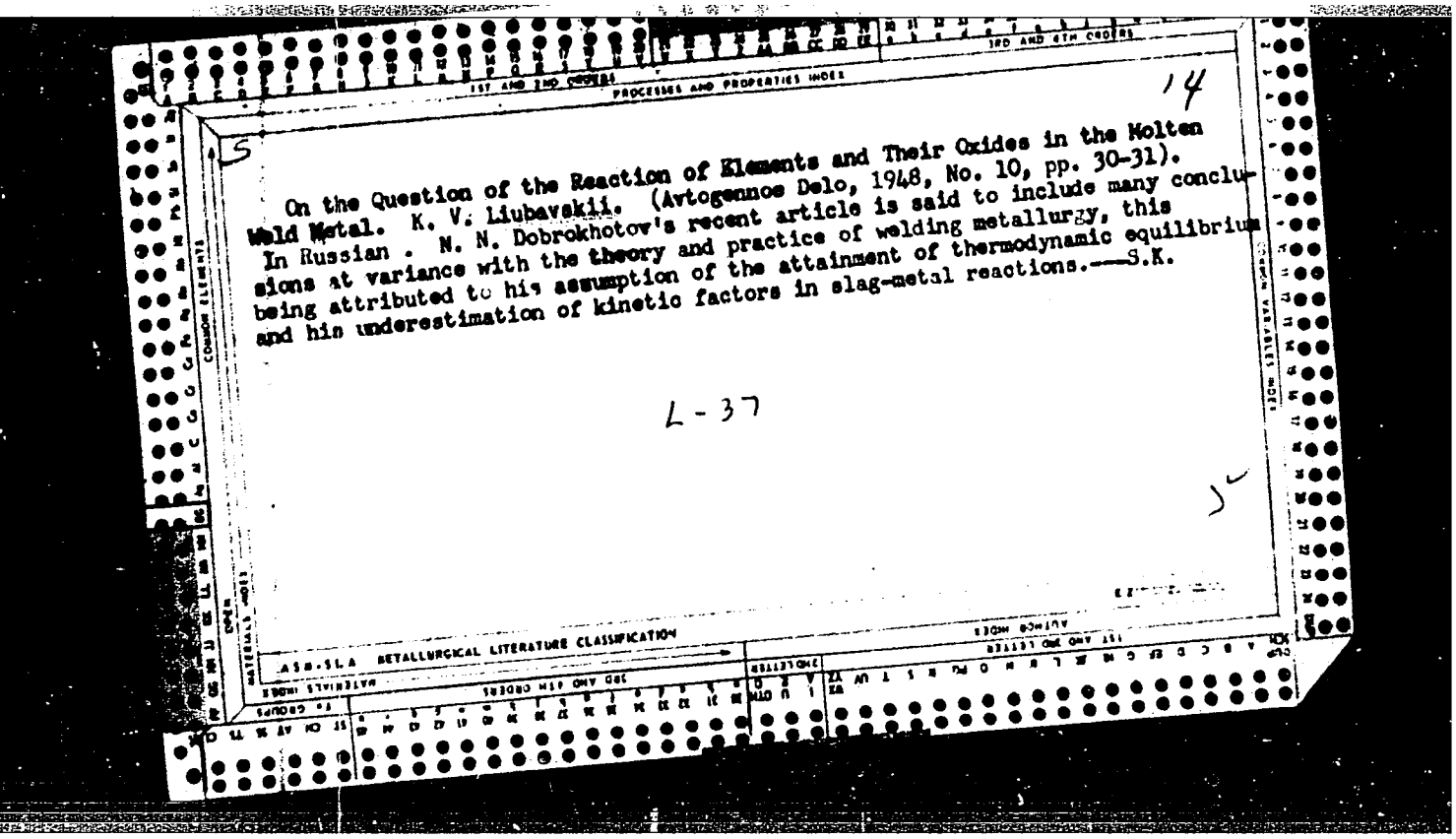
B

7

Influence of Surface Oxides on the Formation of Pores During Welding Under Flux. (In Russian.) K. V. Lyubavskii. *Avtogennoe Delo* (Welding), June 1948, No 6, p. 15-20.

Study of above resulted in the conclusion that the main factor in pore formation is the composition and the viscosity of the fluxes used. Increased concentration of manganous oxide in the flux considerably decreases the tendency of welded surfaces to oxidation, thus decreasing pore formation.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



14

On the Question of the Reaction of Elements and Their Oxides in the Molten Weld Metal. K. V. Liubavskii. (Avtogennoe Delo, 1948, No. 10, pp. 30-31). In Russian . N. N. Dobrokhotov's recent article is said to include many conclusions at variance with the theory and practice of welding metallurgy, this being attributed to his assumption of the attainment of thermodynamic equilibrium and his underestimation of kinetic factors in slag-metal reactions.——S.K.

L-37

LYUBAVSKIY, K. V.

PA 42/49T19

USSR/Engineering — Jan 49
Welding, Electric
Boilers, High-Pressure

"Automatic Welding of Boiler Steel of Great Thicknesses by Power Arcs," Prof K. V. Lyubavskiy, Dr Tech Sci, B. I. Lazarev, Engr, TsNIITMASh, 9 pp

"Avtogennoye Delo" No 1

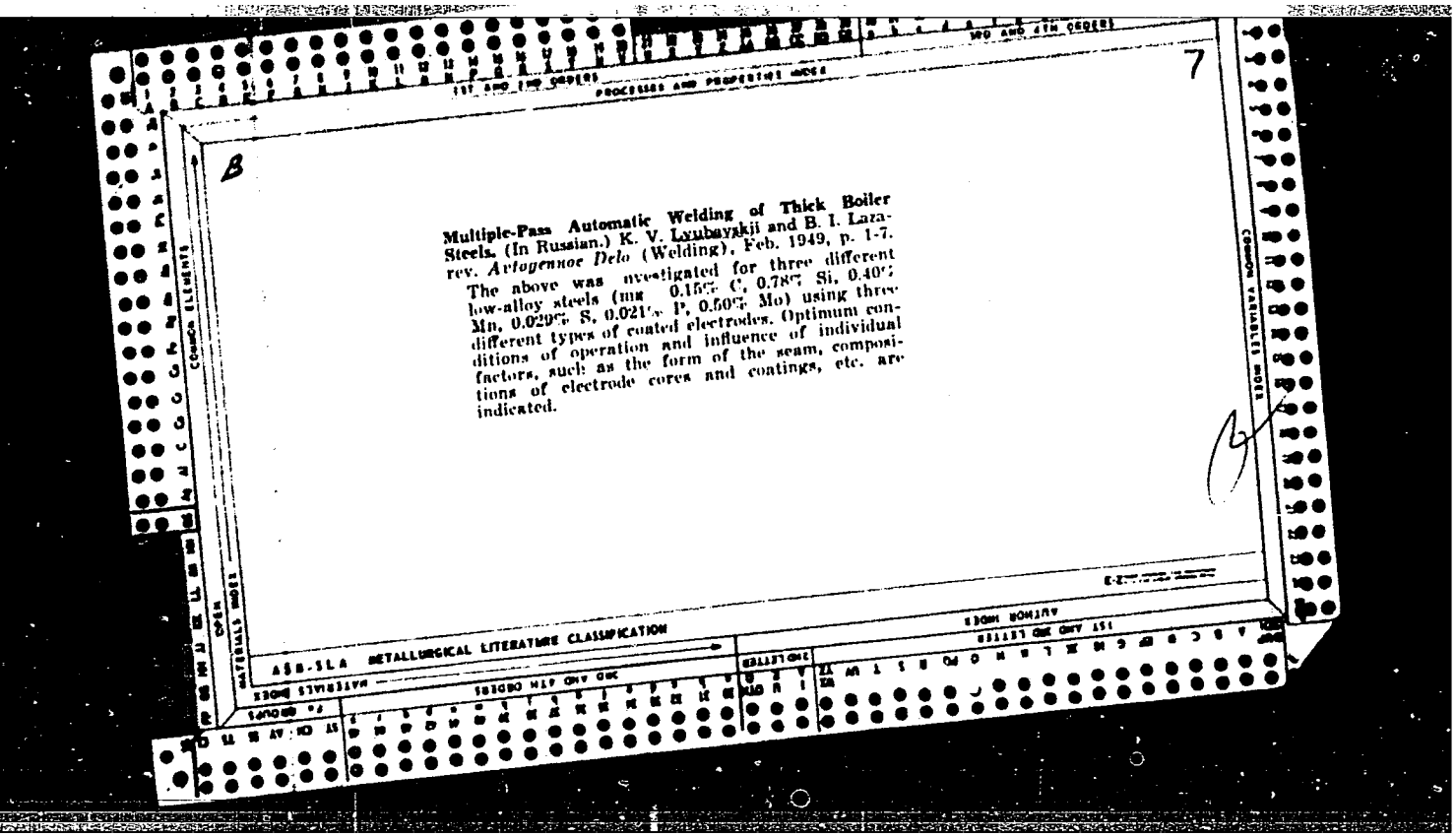
Praises successful use of automatic welding of thick-walled "first-class" containers, which include high-pressure boiler. Claims, however, that these containers require a certain technique for the welding of seams, as in flux welding.

[redacted] 42/49T19

USSR/Engineering (Contd) — Jan 49

Discusses experimental tests and reveals that the flux-forming possibility during welding of very thick steel, according to technological flux tests and chemical analyses of seam metal, is determined by the flux's physical characteristics and conditions. Gives tables and illustrations of performed tests.

[redacted] 42/49T19



Multiple-Pass Automatic Welding of Thick Boiler Steels. (In Russian.) K. V. Lyubavskii and B. I. Lazarev. *Avtogennoe Delo* (Welding), Feb. 1949, p. 1-7.

The above was investigated for three different low-alloy steels (max 0.15% C, 0.78% Si, 0.40% Mn, 0.029% S, 0.021% P, 0.50% Mo) using three different types of coated electrodes. Optimum conditions of operation and influence of individual factors, such as the form of the seam, compositions of electrode cores and coatings, etc. are indicated.

LYUBAVSKIY, K. V.

USSR/Engineering
Welding, Autogenous
Steel Alloys

Apr 49

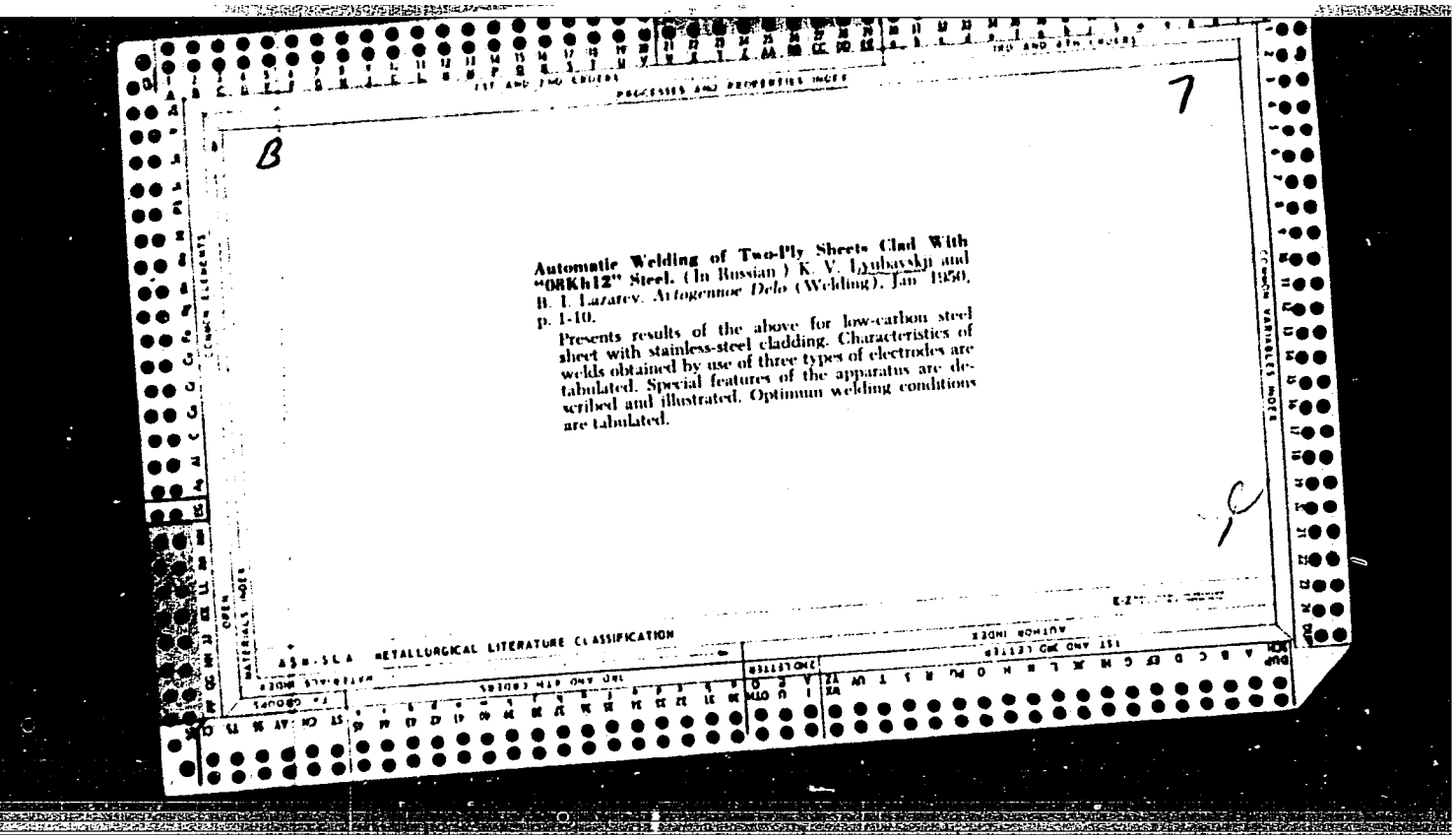
"Several Metallurgical Problems in the Automatic Welding of EYal-T Steel Using Flux," Prof K. V. Lyubavskiy, Dr Tech Sci, TsNIITMASh, 6 pp

"Avtogennoye Delo" No 4

High-manganese active flux-silicates which have proper characteristics for welding low-carbon and certain low-alloy steels are unsuitable for welding high-alloy chrome-nickel steel EYal-T of the austenite class. Fluxes which have most satisfactory metallurgical and technological characteristics are those in which proportion of total of basic oxides to total of acid oxides is about 1.2-1.35. These fluxes (FTsL-1 and FTsL-2) must also have admixtures (CaF_2 and TiO_2) which reduce their viscosity in the molten state.

43/49T36

PA 43/49T36



Automatic Welding of Two-Ply Sheets Clad With "ORKh12" Steel. (In Russian.) K. V. Lyubavskii and B. I. Lazarev. *Avtogennoe Delo* (Welding). Jan 1950, p. 1-10.

Presents results of the above for low-carbon steel sheet with stainless-steel cladding. Characteristics of welds obtained by use of three types of electrodes are tabulated. Special features of the apparatus are described and illustrated. Optimum welding conditions are tabulated.

LYUBAVSKIY, K. V., P.[redacted]

USSR/Engineering - Steel, Clad
Welding, Steel

Jan 50

"Automatic Welding of Stainless Clad Steel," Prof K. V. Lyubavskiy, B. I. Lazarev, Engr, Cen Sci Res Inst of Heavy Mach Bldg, 10 pp

"Avtogen Delo" No 1

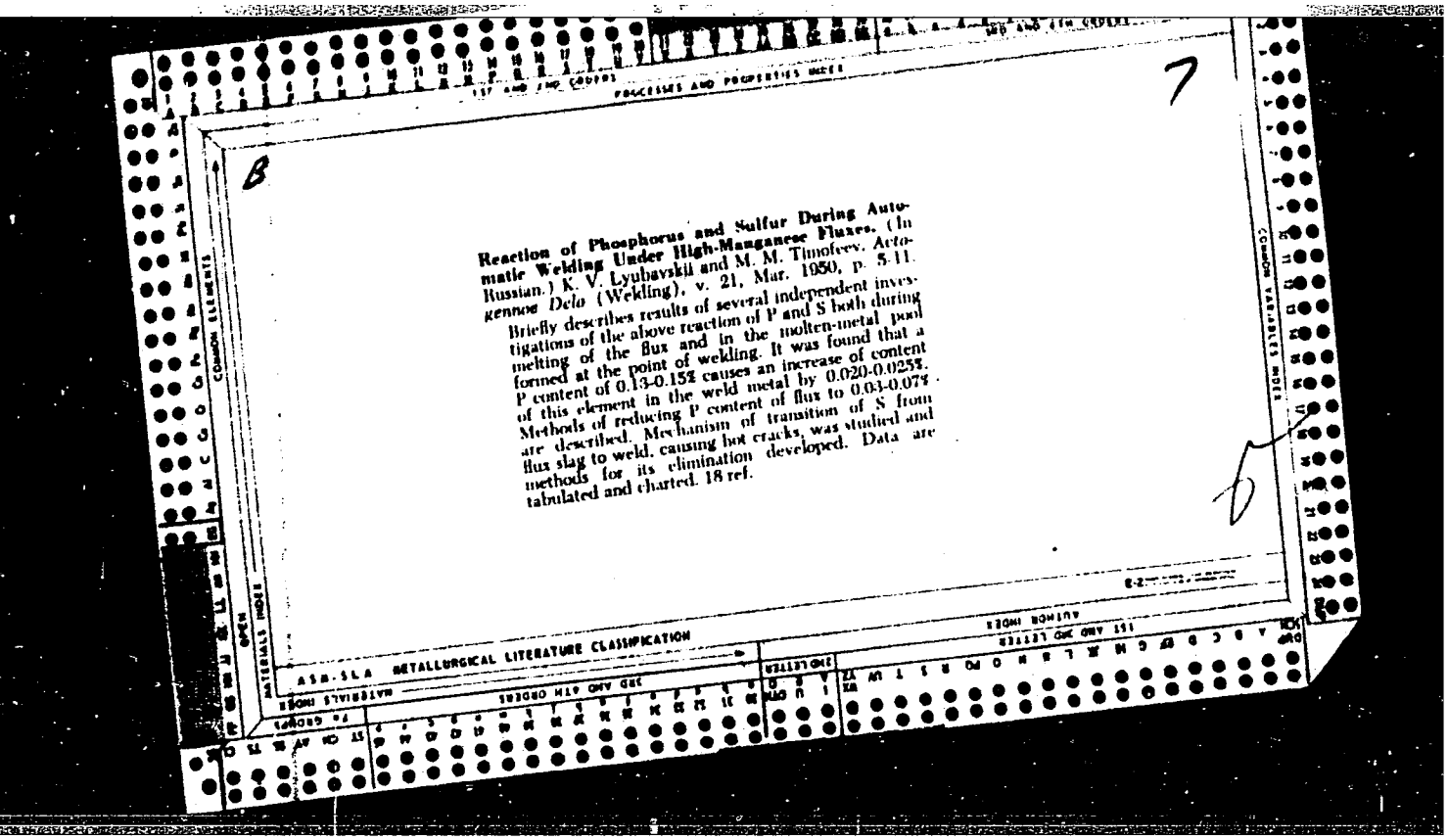
Conducted experiments to develop welding procedure for clad sheets with face layer of chromium steel. Gives data on chemical composition and mechanical properties of welded joints executed with preliminary welding of face layer using electrodes which insure

[redacted] 160T15

USSR/Engineering - Steel, Clad (Contd) Jan 50

obtaining austenitic structure. Results permitted introduction of automatic welding method at Mach-Bldg Plant imeni Ordzhonikidze.

160T15



Reaction of Phosphorus and Sulfur During Automatic Welding Under High-Manganese Fluxes. (In Russian.) K. V. Lyubavskii and M. M. Timofeev. *Avtogennoe Delo* (Wekling), v. 21, Mar. 1950, p. 5-11.

Briefly describes results of several independent investigations of the above reaction of P and S both during melting of the flux and in the molten-metal pool formed at the point of welding. It was found that a P content of 0.13-0.15% causes an increase of content of this element in the weld metal by 0.020-0.025%. Methods of reducing P content of flux to 0.03-0.07% are described. Mechanism of transition of S from flux slag to weld, causing hot cracks, was studied and methods for its elimination developed. Data are tabulated and charted. 18 ref.

LYUBAVSKIY, K.V. (Prof)

USSR/Engineering - Welding, Fluxes Jun 51

"Influence of Variation in Composition on the Properties of High-Manganese Flux," Prof K. V. Lyubavskiy, Dr Tech Sci, M. M. Timofeyev, Engr

"Avtogen Delo" No 6, pp 5-9

Investigation was conducted for detg the effect of changes in concn of maganous oxide, silicon dioxide, calcium oxide, alumina and calcium fluoride on the technological and metallurgical properties of high-manganese fluxes. Tabulates results.

200T33

USSR/Engineering - Welding, Methods   Nov 51

"Automatic Welding of 15 M (Molybdenum) Steel of Large Thickness Using Three-Phase Arc," Prof K. V. Lyubavskiy, Dr Tech Sci, B. I. Lazarev, Cand Tech Sci, M. M. Timofeyev, Engr

"Avtogen Delo" No 11, pp 7-10

Expts for welding plates 135 mm thick established adaptability of 3-phase arc to automatic multiple-pass welding of heavy sections of steel used in fabrication of boilers and various thick-walled containers. Two new fluxes, developed in

200T62

USSR/Engineering - Welding, Methods   Nov 51
(Contd)

investigation, are less harmful, due to decreased gas evolution, and secure uniform compn of weld metal.

200T62

LYUBAVSKIY, K.V. (Prof)

LYUBAVSKIY, K.V., doktor tekhnicheskikh nauk, professor, redaktor.

[Research on the technology of welding] Issledovaniia po tekhnologii svarki. Edited by K.V.Liubavskii. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroitel'noi lit-ry, 1953. 199 p. (MLRA 6:11)
(Electric welding)

LYUBAVSKIY, K.V.

Index Aeronauticus
Review of Technical
Information
Vol. 10 No. 1
Jan. 1954
Workshop Processes -
Welding, Brazing.

101/101 621.791.85

Arc Welding with Melting Electrodes in a Protective Gas Atmosphere

Avtogen.Delo
pp.4-8
Jan.,1953
U.S.S.R.

K.V. Lyubavski, N.M. Novozhilov

Low carbon, medium carbon, low alloy steel and stainless steel have been welded in an atmosphere of carbon dioxide and its mixtures with other gases. Gas consumption costs less than that of the flux in submerged arc welding. This method is particularly suitable for welding curved and short seams, joining bosses to vessels and joining thin wall sheets. (From Engrs.'Dig.,14(9),336,Sept.,1953,U.K.)

LYUBAVSKIY, K.V.

15050* (Fluxes for Semi-Automatic Welding.) Flusy dlia poluavtomaticheskoi svarki. K. V. Liubavskii and M. M. Timofeev. *Vestnik Mashinostroenila*, v. 33, no. 12, Dec. 1953, p. 45-48.

LYUBAVSKIY, K.V., doktor tekhnicheskikh nauk, professor; LAZAREV, B.I., kandidat tekhnicheskikh nauk; TIMOFEYEV, M.M., kandidat tekhnicheskikh nauk.

Automatic welding of thick steel with a three-phase arc. [Trudy] TSNIITMASH 60:5-31 '53. (MLRA 6:11)
(Electric welding)

LYUBAVSKIY, K.V., doktor tekhnicheskikh nauk, professor, redaktor; GOLOVIN, S.Ya., inzhener, redaktor; CHERNYSHEVA, N.P., redaktor; MATVEYEVA, Ye.N., tekhnicheskiy redaktor

[New developments in welding technology] Novoe v tekhnologii svarki. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry 1955. 246 p. (MLRA 8:10)
(Welding)

TS227.L66 TREASURE ISLAND BOOK REVIEW AID 781 - S

LYUBAVSKIY, K. V., Dr. of Tech. Sci., PASHUKANIS, F. I., Eng., LAZAREV, B. I., Kand. of Tech. Sci., and TOROPOV, V. A., Kand. of Tech. Sci.

SVARKA AUSTENITNYKH STALEY, PREDNAZNACHENNYKH DLYA RABOTY PRI POVYSHENNYKH TEMPERATURAKH (Welding of Austenitic Steels Designated to Withstand High Temperatures). In K. V. Lyubavskiy, ed. Novoye v tekhnologii svarki (Innovations in the Welding Technique). MAShGIZ, 1955. p. 3-29.

The authors present an interpretation of the data obtained in research conducted by the Central Scientific Research Institute of Machine-Building Technology (TsNIITMASh) on arc welding of austenitic steels used in forging, casting and tubing. The temperatures in various places in the welded parts are observed. The crystallization which occurs in welded metals, the mechanical properties of welded sections, and the structure of the metal in the seam after welding are discussed. The use of electrodes and their effects on various austenitic steels under different conditions in welding and on welding parts are described. The authors recommend certain electrodes for welding austenitic steels used in tubing, forging and castings. Twenty seven pictures and graphs, 9 tables. 3 Russian references (1936-1951).

1/1

TS227.L66 TREASURE ISLAND BOOK REVIEW AID 782 - S

LYUBAVSKIY, K. V., Dr. of Tech. Sci., and TOROPOV, V. A., Kand. of Tech. Sci.

K VOPROSU OBRAZOVANIYA TRESHCHIN PRI DUGOVOY SVARKE AUSTENITNYKH STALEY (Origin of Hot Flows in Arc Welding of Austenitic Steel). In K. V. Lyubavskiy, ed. Novoye v tekhnologii svarki (Innovations in the Welding Technique). MAShGIZ, 1955. p. 30-55.

The authors discuss some causes of 'hot flows', certain defects in cast metal which are one of the outstanding difficulties in the welding of austenitic steels. The Kh18N9T - mark of steel is one of the most widely used of this steel group. They fully discuss the results of investigation of the influence of sulfur, sulfur and manganese, silicon, carbon, columbium, molybdenum, tungsten and vanadium used in the formation of high-alloyed austenitic steels, and make suggestions for practical application of the results obtained. Sixteen pictures and graphs, 7 tables. 21 Russian references, 1941-1952.

1/1

TS227.L66 TREASURE ISLAND BOOK REVIEW AID 783 - S

LYUBAVSKIY, K. V., Dr. of Tech. Sci., and LAZAREV, B. I., Kand of Tech. Sci.

SVARKA VYSOKOPROCHNOY STALI DLYA TOLSTOSTENNYKH SOSUDOV VYSOKOGO DAVLENIYA (Welding of High-Strength Steel for Thick-walled Vessels under High Pressures). In K. V. Lyubavskiy, ed. Novoye v tekhnologii svarki (Innovations in the Welding Technique). MAShGIZ, 1955. p. 56-81.

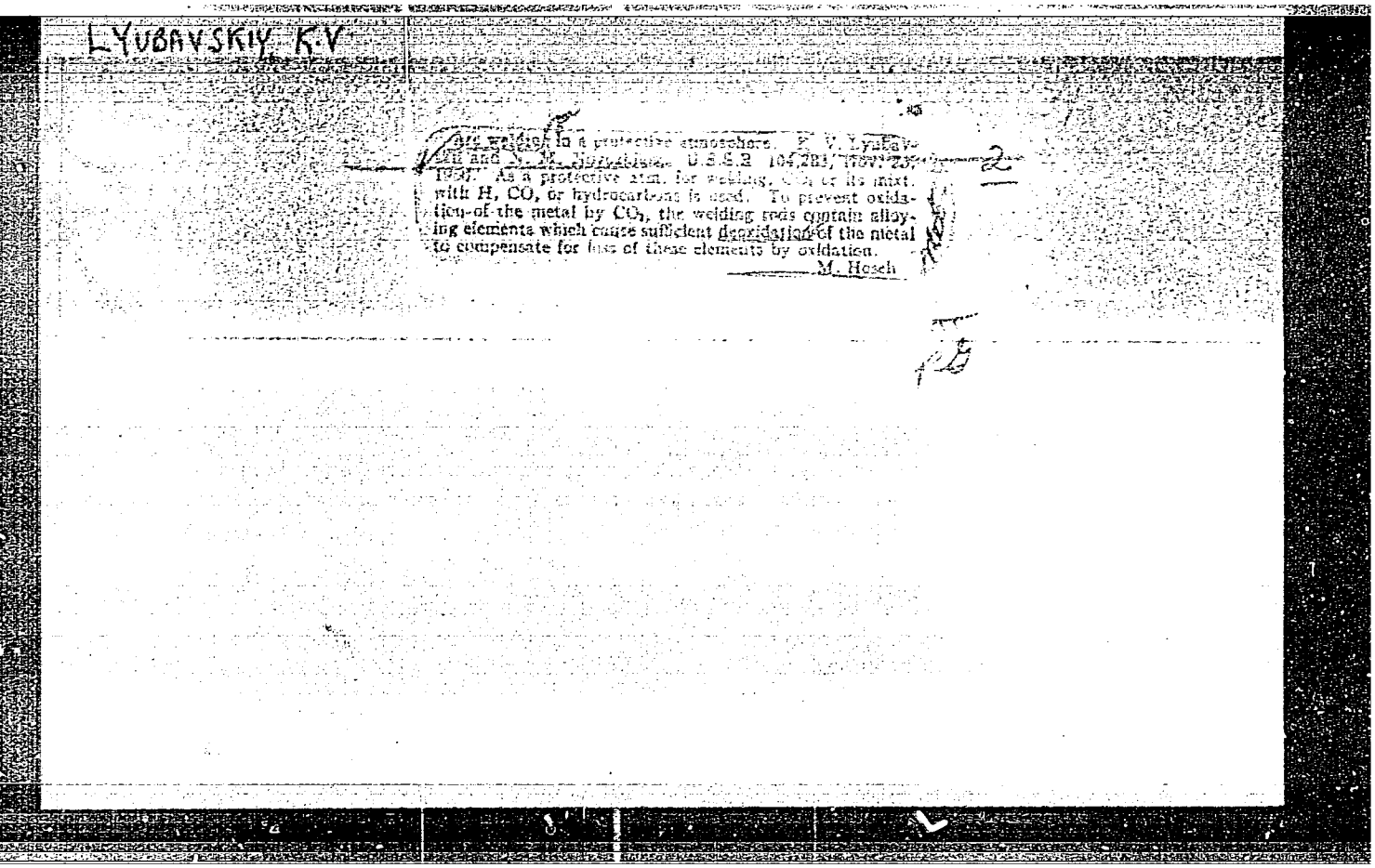
The authors present the exhaustive material on research carried out by them (and other scientists) on low-alloyed steels to be used in the construction of thick-walled vessels under high pressures. The 16GNM-type steel is the main subject of this report. Its experimental weldings with the FTs-6 and FTs-7 fusing agents and by the TsL-21 electrodes are described. Mechanical properties of the 16GNM-type steel and the chemical composition of the EI569 wire used as electrode are shown. Twenty seven pictures (including a general view of a huge cylindrical vessel designed to withstand high pressures, p. 80,) and graphs, 11 tables. 4 Russian references, 1948-1953.

1/1

LYUBAVSKIY, K.V.

769* Some Peculiarities of Welding Cast Austenitic Steels. Nekotoryye osobennosti svarki litykh austenitnykh staley. (Russian.) K. V. Lyubavskiy and F. I. Pashukanis. Svarochnoe proizvodstvo, 1955, no. 9, Sept., p. 1-6.

Intercrystalline cracking; micro-structure of multilayer welding; brittleness and grain coarseness; effect of heat treatment on weld strength. Micrographs, tables, diagrams. 6 ref.



LYUBAVSKIY, K.V.

Arc welding in a protective atmosphere. P. V. Lyubavskii and K. V. Lyubavskii. U.S.S.R. 104,281, Nov. 25, 1956. As a protective atm. for welding, CO_2 or its mixt. with H, CO, or hydrocarbons is used. To prevent oxidation of the metal by CO_2, the welding rods contain alloying elements which cause sufficient deoxidation of the metal to compensate for loss of these elements by oxidation.

M. Hosch

LYUBAVSKIY K.V.

1-PTB

Electrodes for welding EI 257 steel. K. V. Lyubavskiĭ and B. I. Lazarev. *Svarochnoe Proizvodstvo* 1956, No. 7, 1–6.—This steel (compn. not given) after quenching and tempering at 750–800° has a structure of γ solid soln. with a finely dispersed carbide phase. It has good strength and creep properties during a continuous exposure to 550–600°. Pipes made of it and welded with electrodes of the same compn. showed much hot cracking. Electrodes were developed whose compn. prevented hot-cracking by the presence of α phase, in a concn. so limited as not to prevent entirely the formation of the γ phase. Welding wire selected contained Cr 16–19, Ni 11–14, Mo 2–3% and was coated with a mixt. of CaF_2, marble, and ferrite-forming elements (not specified). It produced 1.5–2.0 to 4.3–5.0% ferrite phase in the seam. Mech. properties of welds made with these electrodes after aging [illegible] at 600° are given. Since the percentage of the α phase in a seam [illegible] by the thermal effect of superimposed layers, a test for the α-phase content in welds was proposed. It consists in depositing 3 adjoining beads on a plate, two beads on them, and one on the last two, and detg. metallographically the α content of the latter only.

PTB ITK

SOV/137-57-10-19447

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 10, p 143 (USSR)

AUTHORS: Lyubavskiy, K.V., Toropov, V.A.

TITLE: On Causes of Hot Cracking During Arc Welding of Austenitic Steels (K voprosu o prichinakh obrazovaniya goryachikh treshchin pri dugovoy svarke austenitnykh staley)

PERIODICAL: V sb.: Probl. dugovoy i kontakt. elektrosvarki. Kiyev-Moscow, Mashgiz, 1956, pp 117-134

ABSTRACT: The authors present in their work some considerations of causes of hot cracking (HC) and discuss the significance of the ferrite phase in high-alloyed austenitic welds (W). In order to verify certain hypotheses regarding the effect of various degrees of solubility of elements in the austenite and ferrite phases on tendency of W toward HC, the effect of S, Mn, P, Si, C, Nb, Mo, tungsten, and V was investigated. It is confirmed experimentally that the resistance of weld metal to HC depends on the concentration of segregating elements present in the zone of fusion, as well as on the degree to which certain of these elements, namely those which tend to segregate and form relatively fusible eutectics, are soluble in phases undergoing crystallization. This last statement applies also to

Card 1/2

On Causes of Hot Cracking During Arc Welding of Austenitic Steels

ferrite-forming elements (Si, Nb, V) which are sparingly soluble in austenite. The fact that the ferrite phase (primary ferrite) reduces the HC tendencies of austenitic W is attributable to the ability of δ ferrite (as compared with the γ solution) to dissolve greater amounts of Nb, Si, V, P, etc., reducing at the same time the segregation of these elements and limiting the formation of fusible eutectics along the boundaries of crystals. Increasing the concentration of Ni eliminates the δ ferrite in the process of crystallization of the W and all other conditions being equal, increases the susceptibility of the latter to the formation of hot cracks produced by ferrite-forming hardening elements and by P. The effect of S on HC tendencies of austenitic W, both with and without a ferrite phase varies considerably depending on the concentration of Mn and Ni in the metal of the W. Increasing the concentration of Mn reduces the HC tendencies of the W. A certain amount of ferrite or V prevents the formation of hot cracks produced by Si and Nb. Mo and tungsten do not form fusible eutectics in alloys containing Ni, Cr, and Fe, and therefore, do not produce HC of austenitic W at the concentrations investigated.

Card 2/2

A.R.

KOCHANOVSKIY, N.Ya., kandidat tekhnicheskikh nauk; LYUBAVSKIY, K.V., professor, doktor tekhnicheskikh nauk; KORCHEMKIN, A.Ye., inzhener.

Decision of the conference on welding in an atmosphere of protective gasses. Svar. proizv. no.9:3 of cover S '56.
(MLRA 9:11)

1. Zamestitel' direktora Vsesoyuznogo nauchno-issledovatel'skogo instituta elektrosvarochnogo oborudovaniya po nauchnoy chasti (for Kochanovskiy) 2. Predsedatel' sektsii svarki TSentral'nogo pravleniya nauchno-tekhnicheskogo otdela MAShPROM (for Lyubavskiy).
(Electric welding)
(Protective atmospheres)

Subject : USSR/Engineering AID P - 5282

Card 1/2 Pub. 107-a - 18/18

Authors : Kochanovskiy, N. Ya., Kand. of Tech. Sci., K. V. Lyubavskiy, Dr. of Tech. Sci., A. Ye. Korchemkin, Eng. (Members of the Presidium of the Convention)

Title : Convention on welding in the atmosphere of various protective gases.

Periodical : Svar. proizv., 9, 33, S 1956

Abstract : A brief report on Convention Proceedings with reports on welding under protection of argon, helium, carbon dioxide and nitrogen, and other related matters, held in Leningrad, May 8 and 9, 1956.

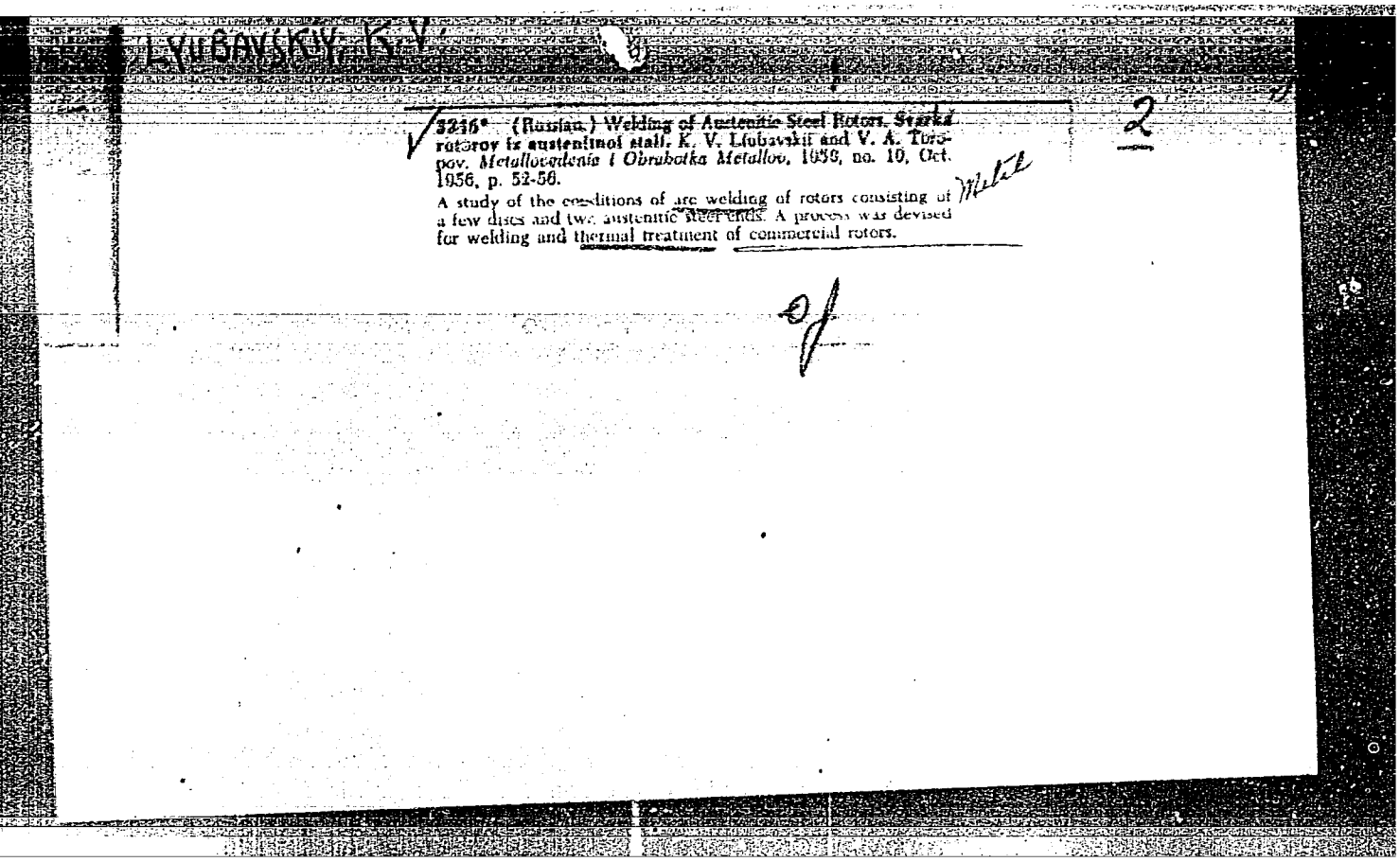
Institutions: (participating in the Convention) - All-Union Scientific Research Institute of Electrical Welding Equipment (VNIIESO), Scientific Research Institute of Aviation Technology (NIAT), Central Scientific Research Institute

Svar. proizv., 9, 33, S 1956

Card 2/2 Pub. 107-a - 18/18

of Machine-Building Technology (TsNIITMASh), All-Union Scientific Research Institute of the Autogenous Treatment of Metals (VNIIAvtogen), the Laboratory for Electric Welding Machines of the Academy of Sciences of the USSR, Institute of Electromechanics of the Academy of Sciences of the USSR, Leningrad Polytechnic Institute, and representatives from various plants, such as "Elektrik", im. Lenin, Kirov, etc.

Submitted : No date

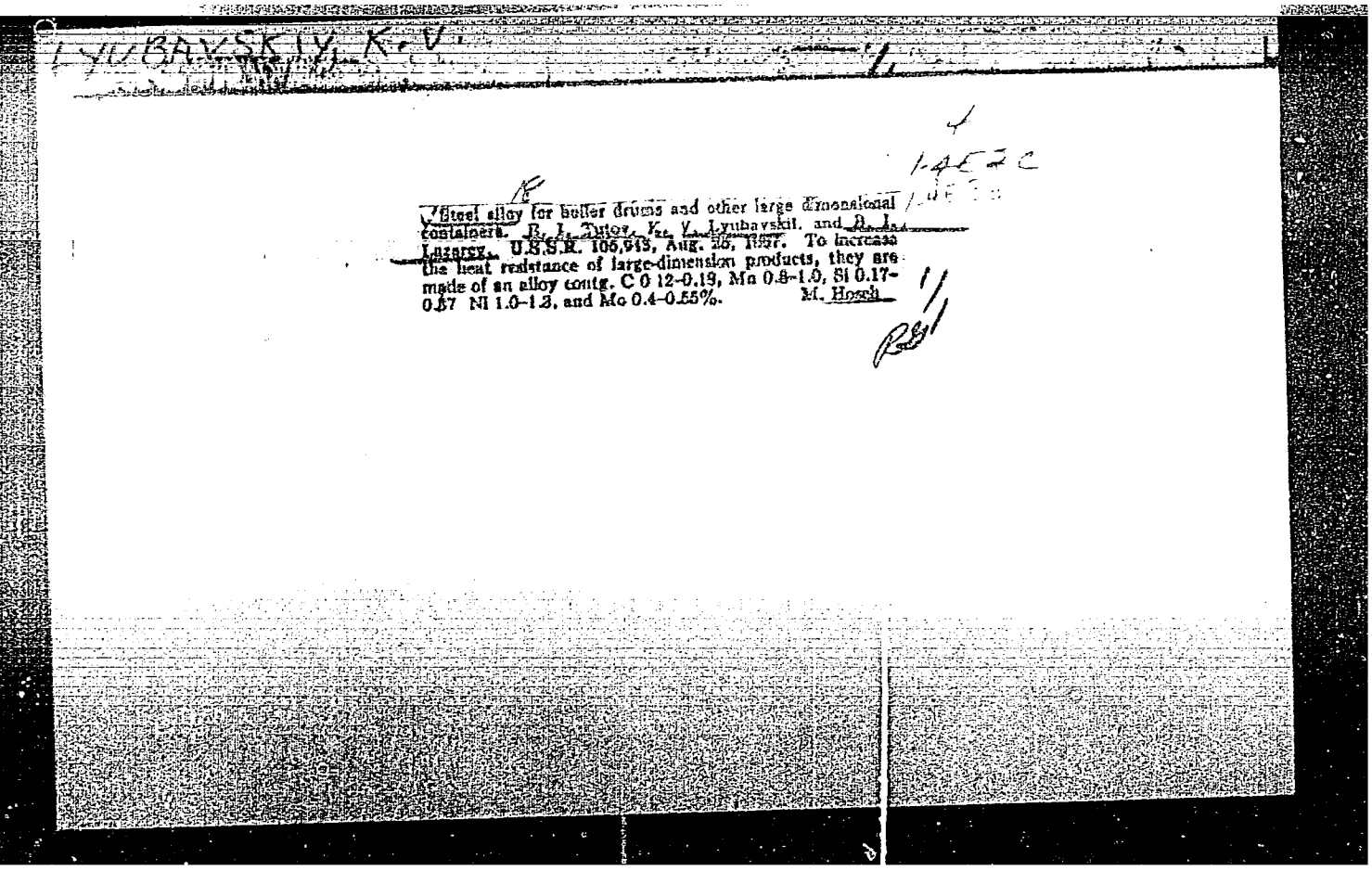


L'VUBAVSKIY, K. V.

3216* (Russian) Welding of Austenitic Steel Rotors. Svarka rotorov iz austenitnoi stali. K. V. Lyubavskii and V. A. Tursov. *Metallovedenie i Obrabotka Metallov*, 1956, no. 10, Oct. 1956, p. 52-56.

A study of the conditions of arc welding of rotors consisting of a few discs and two austenitic steel ends. A process was devised for welding and thermal treatment of commercial rotors.

2



LYUBAVSKIY, K. V.

Steel alloy for boiler drums and other large dimensional containers. B. I. Tutov, K. V. Lyubavskii, and B. I. Lazarev. U.S.S.R. 105,915, Aug. 25, 1957. To increase the heat resistance of large-dimension products, they are made of an alloy contg. C 0.12-0.19, Mn 0.8-1.0, Si 0.17-0.37 Ni 1.0-1.3, and Mo 0.4-0.55%. M. Hosch

LYUBAVSKIY, K.V., prof., doktor tekhn.nauk, otvetstvennyy red.; ZVEGINTSEVA, K.V., inzh., red.; KATLER, S., kand.tekhn.nauk, red.; TYUL'KOV, M.D., kand.tekhn.nauk, red.; PETROV, A.V., kand.tekhn nauk, red.

[Gas-shielded arc welding; papers at the All-Union Scientific Conference on Gas-Shielded Welding] Voprosy dugovoi svarki v zashchitnykh gazakh; doklady k Vsesoiuznomu nauchno-tekhnicheskomu soveshchaniiu po svarke v zashchitnykh gazakh. Moskva, 1957. 250 p. (MIRA 11:5)

1. Nauchno-tekhnicheskoye obshchestvo mashinostroitel'noy promyshlennosti. Sektsiya svarki metallov.
(Electric welding) (Protective atmospheres)

SOV/137-58-7-15027

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 159 (USSR)

AUTHOR: Lyubavskiy, K.V., Yarovinskiy, L.M.

TITLE: The State of the Art of Electric Welding and Certain Problems of its Technology (Sovremennoye sostoyaniye i nekotoryye problemy tekhnologii elektricheskoy svarki plavleniyem)

PERIODICAL: V sb.: Sovrem. napravleniya v obl. tekhnol. mashinostr. Moscow, Mashgiz, 1957, pp 258-280

ABSTRACT: A brief survey of the major stages in the development of contemporary arc and electric slag welding (W) in the USSR. In the process of manual arc W, electrodes (E) are all-important. Our industry has at its disposal various types of E's for various purposes. In connection with W of heat-resistant austenite steels, E have been developed which produce welds composed of metal with a two-phase structure, as well as E which produce pure austenitic welded joints. E's capable of producing welded seams with a strength of up to 145 kg/mm^2 (after quenching and a low anneal) have been developed for steel St30KhGSA. Tremendous successes have been achieved in the field of mechanization and automation of W. Appropriate

Card 1/2

The State of the Art of Electric Welding (cont.)

equipment and materials have been developed. In automatic W of high-alloyed Cr-Ni steels, best results are obtained with passive fluxes FTsL-2, AN-26, BKF-1, and others which virtually do not react chemically with the liquid metal. The employment of ceramic non-fused fluxes in automatic W makes it possible to control extensively the composition and properties of the welded seams. Tubular "powdered" welding rods make it possible to obtain the most varied compositions of metal in the building up of metal by means of W. The economy afforded by the method of W with consumable electrodes in an atmosphere of CO_2 has opened extensive possibilities for the employment of this method for W of both carbon steels and alloyed steels. A new and very efficient process of electric slag W was developed for operations involving thick sections of metal. Questions on certain problems of technology of electrical W are posed by the authors. Bibliography: 75 references.

O.K.

1. Arc welding--Development 2. Arc welding--Electrodes 3. Welding fluxes--Properties

Card 2/2

LYUBAVSKIY, K.V.

135-6-12/13

SUBJECT: USSR/Welding

AUTHORS: Lyubavskiy, K.V., Professor, Doctor of Technical Sciences, Maslov, G.A., Lecturer.

TITLE: Work of the Group "Welding" of the Scientific-Technical Section of the "Machinebuilding Industry" in 1956 (O rabote sektsii svarki metallov NTO mashinostroitel'noy promyshlennosti v 1956 g.)

PERIODICAL: "Svarochnoye Proizvodstve", 1957, # 6, p 27-28 (USSR).

ABSTRACT: The article contains information on conferences held, organization of training, methods of stimulating initiative and technical progress in welding and makes reference to various organizations and persons involved in the numerous conferences.

In sessions of the Central Welding Section and "MONTO MAShPROM" the following reports were heard: Welding Austenitic Steel in Power Engineering (Professor K.V. Lyubavskiy); Welding of Titanium and Its Alloys (Candidate of Technical Sciences F.E. Tret'yakov); Spot-Welding of Magnesium Alloys (Candidate of Technical Sciences N.Kh. Andreyev); Welding in the CSR. (N.N. Rykalin, member-correspondent of the USSR Academy of Sciences); Welding on RR Equipment in Czechoslovakia and East-Germany

Card 1/3

135-6-12/13

TITLE: Work of the Group "Welding" of the Scientific-Technical Section of the "Machinebuilding Industry" in 1956 (O rabote sektsii svarki metallov NTO mashinostroitel'noy promyshlennosti v 1956g.)

(Engineer A.V. Obukhov); Welding in Bulgaria (Engineer V.M. Kondratovich).

The following specialists have been on journeys abroad: Candidates of Technical Sciences V.M. Nebylova and A.N. Grigor'yeva; Engineer V.L. Russo, who made a report on welding aluminum alloys in British shipbuilding; member-correspondent of the USSR Academy of Sciences N.N. Rykalin, who reported on welding in Switzerland; Engineers Nikolayev and Kuzminov, who reported on the welding conference in East Germany and on Finnish shipyards.

Engineers of the Batumi Machinebuilding Plant, collectively with the Welding Section, are putting into practice the flux welding method for constructing pressure vessels. At the Khar'kov Turbine Plant, the Society members German, Kulakova, Levenberg and others have put into practice the argon welding method for production of large austenitic-steel constructions, as well as welding in carbon dioxide.

The article lists the following active Society members:

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135-6-12/13

TITLE: Work of the Group "Welding" of the Scientific-Technical Section of the "Machinebuilding Industry" in 1956 (O rabote sektsii svarki metallov NTO mashinostroitel'noy promyshlennosti v 1956 g.)

Lecturer G.D. Nikiforov, Candidate of Technical Sciences, I.L. Brinberg, Professor N.O. Okerblom, Lecturer G.L. Petrov, Member-Correspondent of the USSR Academy of Sciences N.N. Rykalin Lecturer D.A. Lyukevich, Lecturer O. A. Bakshi, Professor G.A. Nikolayev, Candidate of Technical Sciences A.A. Erokhin, Professor A.A. Alov, Lecturer A.N. Shashkov, Professor A.S. Gel'man, Candidate of Technical Sciences B.D. Orlov, Engineer V.M. Kondratovich, Engineer K.P. Voshchanov, Lecturer A.I. Krasovskiy.

ASSOCIATION: Sektsiya svarki metallov pri TsP NTO MAShPROM (Welding Section of TsP NTO MAShPROM).

PRESENTED BY:

SUBMITTED:

AVAILABLE: At the Library of Congress.

Card 3/3

LYUBAVSKIY, K.V., doktor tekhn.nauk; YAROVINSKIY, [illegible].M., kand.tekhn.nauk

Arc welding in the machinery industry. Svar.proizv.no.11:4-9 N '57. (MIRA 10:12)
(Electric welding) (Machinery industry)

Lyubavskiy, K.V.

129-3-4/14

AUTHORS: Gel'man, A.S., Griboyedova, T.S., Ye.A. Davidovskaya, Lazarev, B.I., Lyubavskiy, K.V., Slepak, E.S., Trunin, I.I. and Fedortsov-Lutikov, G.P.

TITLE: Investigation of the Steel 1X18H12T as Tube Material for Power-generation Equipment (Issledovaniye stali 1Kh18N12T v kachestve trubnogo materiala dlya energoustanovok)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, No.3, pp. 16 - 24 (USSR).

ABSTRACT: For producing tubes operating at super-critical steam parameters, it is necessary to have available a cheap, strong and ductile material which has a stable structure and stable properties at 550 to 650 °C, is not inclined to develop inter-crystallite corrosion and possesses good technological properties. The work carried out in 1952 and 1953 by TsNIITMASh jointly with the imeni Ordzhonikidze Works (Ref.1) proved that it was possible to utilise cheap steel of the type 1X18H9T for operation at high temperatures. Later, complex investigations were carried out with this steel as a material for tubes of super-critical parameter power-generation equipment. The steel 1X18H9T may contain large quantities of ferrite and, after long-duration annealing at 600 to 700 °C, it embrittles due to the formation of a σ-phase. Increase in the nickel content

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Investigation of the Steel 1X18H12T as Tube Material for Power-generation Equipment

to 11-13% brought about an appreciable increase in the stability of the austenite without affecting the high strength. This steel, designated as 1X18H12T steel, does not show any α- or σ-phase separation during ageing at 700 °C for 10 000 hours and at 750 °C for 3 000 hours; only slight quantities of carbides were found to separate out. Thereby, the impact strength is maintained at 22-24 kg/cm^2 for this steel, whilst in the case of the steel 1X18H9T, it drops to 9-18 kg/cm^2. The investigations described in this paper were carried out on commercial tubes, rods and also on laboratory produced steels with compositions as given in Table 1, p.16. The results are entered in tables and plotted in graphs. It is concluded that the steel 1X18H12T, containing 0.08-0.12% C, max. 75% Si, 1-2% Mn, 17-18.5% Cr, 11-13% Ni, max. 0.20% S and max. 0.035% P, is suitable for operation at high temperatures; the Ti content of the steel is thereby determined by means of the formula 5(C-0.02). The best combination of mechanical properties was obtained after annealing at 1 050 to 1 100 °C for 30 min. and cooling in air, and this regime is recommended for tubes as well as for bends. Weld joints should be annealed at 1 000 to 1 050 °C for 1 hour and then cooled in air. The mechanical properties of steels

Investigation of the Steel 1X18H12T as Tube Material for Power-generation Equipment

heat-treated in accordance with these recommendations are entered in Table 6, p.24, for test temperatures of 20, 600, 650 and 700 °C. Practically no embrittlement takes place for this steel after ageing at 600 and 750 °C for durations of 3 000 to 10 000 hours; no σ-phase formation could be detected after such ageing for steel containing 12% Ni, whilst under similar conditions, σ-phase formation can occur in steel containing 10 % Ni. Preliminary, non-uniform work-hardening influences the ultimate strength of the steel, but does not influence appreciably the ductility in the case of long-duration loading. In the case of contact-welding of tubes of superheaters, the strength of non-heat-treated weld joints is not lower than that of the base metal. Steam at 600 °C and long-duration tests for up to 3 000 hours do not affect appreciably the long-duration strength of the steel and of welded joints. The steels 1X18H12T and 1X18H9T are less inclined to develop thermal fatigue than the steel 1X14H14B2M, and the authors recommend using the steel 1X18H12T for tubes of power-generating equipment, operating with steam of super-critical parameters. There are 5 figures, 6 tables and 8 references, 5 of which are Russian, and 3 English.

129-3-4/14

Investigation of the Steel 1X18H12T as Tube Material for Power-generation Equipment

ASSOCIATION: TsNIITMASh

AVAILABLE: Library of Congress

Card 4/4

LYUBAVSKIY, K.V.

135-58-8-1/20

AUTHORS: Runov, A.Ye., and Pashukanis, F.I., Engineers, Lyubavskiy, K.V., Professor, Doctor of Technical Sciences

TITLE: Some Problems of Welding "1Kh20N12T-L" Cast Austenitic Steel (Nekotoryye voprosy svarki litoy austenitnoy stali 1Kh20N12T-L)

PERIODICAL: Svarochnoye proizvodstvo, 1958, Nr 8, pp 1-7 (USSR)

ABSTRACT: The satisfactory results of tests carried out at TsNIITMASh with the participation of S. A. Yodkovskiy, Candidate of Technical Sciences, S. P. Nestertsev, Candidate of Technical Sciences, G. P. Fedortsov-Lutikov, Candidate of Technical Sciences, T.S. Griboyedova, Engineer, A. V. Stepanov, Engineer, and L. P. Kestel', Engineer, necessitated systematic investigations into the weldability, composition and choice of electrodes for a new grade of cast austenitic steel destined for large-size welded-cast structures of power installations, working permanently at a temperature of 600°C. It was concluded that a certain quantity of ferrite phase in the initial crystalline structure, practi-

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Some Problems of Welding "1Kh20N12T-L" Cast Austenitic Steel

cally eliminated crack formation at the weld joints. "TsT-15"-electrodes proved very satisfactory and are recommended. There are 4 photos, 3 tables, 6 graphs, 2 diagrams and 7 Soviet references.

ASSOCIATION: TsNIITMASh

1. Welding--Test methods 2. Welding--Test results

SOV-135-58-10-1/19

AUTHORS: Lyubavskiy, K.V., Doctor of Technical Sciences, Professor, and L'vova, Ye.P., Engineer

TITLE: New Fluxes for Arc Welding (Novyye flyusy dlya dugovoy svarki)

PERIODICAL: Svarochnoye proizvodstvo, 1958, Nr 10, pp 1-5 (USSR)

ABSTRACT: Information is presented on experimental studies carried out at TsNIITMASh which resulted in the development of new ceramic, non-oxidizing "FTsK" fluxes having considerable technological advantages over the usual ceramic fluxes as e.g. easy separation of the slag crust from the surface. The new fluxes are suitable for welding high-alloy steels, including corrosion- and heat-resistant steels and alloys. It is expected that, if the raw material is sufficiently pure, these fluxes could be used for welding titanium and its alloys.

ASSOCIATION: TsNIITMASh

1. Welding fluxes--Development 2. Welding fluxes--Applications

Card 1/1

Lyubavskiy, K.V.

28(1) PHASE I BOOK EXPLOITATION SOV/2156

Soveshchaniye po kompleksnoy mekhanizatsii i avtomatizatsii tekhnologicheskikh protsessov. 2nd, 1956.

Avtomatizatsiya mashinostroitel'nykh protsessov; /trudy soveshchaniya/, tom. 1: Goryachaya obrabotka metallov (Automation of Machine-Building Processes; Proceedings of the Conference on Over-All Mechanization and Automation of Technological Process, Vol 1: Hot Metal-Forming) Moscow, 1959. 394 p. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya.

Resp. Ed.: V.I. Dikushin, Academician; Compiler: V.M. Raskatov; Ed. of Publishing House; V.A. Kotov; Tech. Ed.: I.F. Kuz'min.

PURPOSE: The book is intended for mechanical engineers and metallurgists.

COVERAGE: The transactions of the Second Conference on the Over-All Mechanization and Automation of Industrial Processes, September 25-29, 1956, have been published in three volumes. This book, Vol. I, contains articles under the general title, Hot Working of Metals. The investigations described in the book were conducted by the Sections for Automation and Hot Working of Metals, under the direction of the following scientists: casting - P.N. Aksenov, D.P. Ivanov and G.M. Orlov; forming - A.I. Tselikov, A.D. Tomlenov and V.T. Meshcherin; welding - G.A. Nikolayev, B.I. Frolov and G.A. Maslov. There are 183 references: 142 Soviet, 34 English, 6 German, and 1 French.

TABLE OF CONTENTS:

AVAILABLE: Library of Congress

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9/15/59

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(11)

LYURA'SKIY, K.V., prof., doktor tekhn. nauk; BAD'YANOV, B.N., inzh.;
CHEPELYUGIN, G.F., inzh.

Effect of flux on the properties of seams in high-strength steel welding. Svar. proizv. no.2:23-25 F '59. (MIRA 12:1)

1.Kafedra "Svarochnoye proizvodstvo" Moskovskogo vechernego metallurgicheskogo instituta.
(Flux (Metallurgy)) (Steel--Welding) (Welding--Testing)

LYUBAVSKIY, K.V., prof., dekter tekhn. nauk; L'VOVA, Ye.P., inzh.

Eighth international congress on welding in Czechoslovakia. Svar. proizv. no.2:44-45 F '59. (MIRA 12:1)
(Czechoslovakia--Welding-Congresses)

SOV/135-59-4-3/18

25 (1)
18 (7)

AUTHORS: Lyubavskiy, K. V., Doctor of Technical Sciences, Professor; Studnits, M. A., Candidate of Technical Sciences.

TITLE: An Investigation of Carbon Distribution in Welded Areas and Weld Seams. (Izucheniye raspredeleniya ugleroda v okoloshovnoy zone i metalle shva)

PERIODICAL: Svarochnoye proizvodstvo, 1959, Nr 4, pp 7 - 12 (USSR)

ABSTRACT: The article contains a detailed description of experiments carried out by the authors in studying the migration of carbon in welded joints. This can be a cause of cracks forming at the joints of pipelines welded at high temperatures and sometimes leads to the destruction of a joint. The possibility of such migration was discovered in other projects. (Ref. 1 - 7). The phenomenon was studied on two metallurgically different weld connections with the use of a radioactive carbon isotope (C^{14}) and autoradiography. The study resulted in the following conclusions:
1) there was no diffusion of carbon in the fusion zone

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in the initial state of the weld joint; 2) stabilization of the joints of steel EI 257 for 20 hours at 800°C resulted in appreciable diffusion of carbon from the base metal into the weld metal. The carbon content in the narrow zone adjacent to the line of fusion (of about 0.1 mm width) diminished from 0.11 and 0.06% and correspondingly increased in the weld metal at the line of fusion; 3) in the case of no chemical difference between the base and the weld metal (steel "7" was used in the experiments) stabilization caused considerably less noticeable non-uniformity of carbon distribution; 4) austenization gave considerably less non-uniformity of carbon distribution than stabilization, in the case of steel "EI257", and no directed carbon diffusion at all in the other steel ("7", or the electrodes "TsT-7"); 5) aging of specimens of "EI257" steel, stressed or not, at 580 to 600°C for 1000 hours resulted in appreciable carbon diffusion into the weld metal, although the carbon redistribution in this case was considerably less intensive than in heat-treated (stabilized or austenized) specimens, that were not subjected to subsequent aging. In the other

An Investigation of Carbon Distribution in Welded Areas and Weld Seams.

steel ("7") there was again no apparent diffusion after aging; 6) aging after heat treatment (austenization and stabilization) for 1000 hours at 580 - 600°C, in stressed and non-stressed condition, had no appreciable effect on distribution of carbon in the area of welding; 7) the intensity of carbon diffusion in welded connections of austenitic steel is determined to a large degree by the difference in the content of carbide-forming elements in the base and the weld metal; 8) further study of the effect of the diffusion processes developing in welded joints in austenitic steel under heat treatment and in operation is necessary. There are 4 sets of autoradiograms, 6 graphs, 2 diagrams, 4 tables, and 12 Soviet references.

ASSOCIATION: TsNIITMASh; filial VNII (Branch VNII)

SOV/135-59-9-5/23

18(5,7)

AUTHORS: Runov, A. Ye., Engineer, Lyubavskiy, K. V., Doctor of Technical Sciences, Professor

TITLE: The Influence of Ferrite-Phase on the Qualities of Weld Metal and Basic Metal of Welded Joints Made of Chromium Nickel Austenitic Steels

PERIODICAL: Svarochnoye proizvodstvo, 1959, Nr 9, pp 15-19 (USSR)

ABSTRACT: The authors present a study on the influence of the ferrite phase on the durability of welded joints of chromium-nickel austenitic steels. The basic data of this article were reported at the Moscow conference of NTO Mashprom - TsNIITMASh on welding of heat resistant alloys in November 1958. Investigations were made on weld metal type 1Kh19N10B of two compositions, and on cast metal type 1Kh20N12T steel of different initial quantities of ferrite (Table 1). Electrodes type TsT-15 were used. The influence of the composition of austenitic-ferrite metal on the intensity of the ferrite phase decomposition and its brittling during the process of stabilizing heat treatment was investigated in weld and

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The Influence of Ferrite-Phase on the Qualities of Weld Metal and Basic Metal of Welded Joints Made of Chromium-Nickel Steels

cast metal of different composition (Table 2). For stabilizing heat treatment a temperature of 800°C was used. This is within the temperature interval of maximum brittling. All investigated metals had about the same initial quantity of ferrite (6-7%). The investigations showed, that at equal initial quantities of ferrite phase and at equal technology of gaining austenitic-ferrite metals the intensity of ferrite decomposition and together with this, the brittling of the metal in heating within the temperature interval of 550-900°C, depends mostly on the change (sometimes very little change) of their chemical composition. Engineer M. I. Solonouts participated in this study. There are 5 graphs, 2 tables and 10 references, 9 of which are Soviet and 1 German.

ASSOCIATION: TsNIITMASh

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SOV/135-59-11-2/26

18(5,7)

AUTHORS: L'yubavskiy, K.V., Doctor of Technical Sciences, Professor, and Sorokina, M.I., Engineer

TITLE: Automatic Submerged-Arc Welding of Thin Sheets of Different Steels

PERIODICAL: Svarochnoye proizvodstvo, 1959, Nr 11, pp 3-6 (USSR)

ABSTRACT: The authors express their thanks to the following persons who assisted in organizing research on the problem treated in this article: Candidate of Technical Sciences F.Ye. Tret'yakov and Engineers S.N. Valeyev, A.B. Karan and B.N. Bad'yanov. The process of automatic submerged-arc welding is widely used. However, until recently, it has not been applied when joining different steels. This was due to the fact that it was hardly possible to obtain such a weld which would meet all the requirements of welded joints, namely, strength, plastic properties, absence of cracks, etc. The authors have researched on experimental methods of welding of two different kinds of steel: EI654 (austenitic-ferrite class), and 30KhGSA (perlite class) hardened steel $\delta = 120$ kg/mm^2. The thickness of welded sheets was 1.5 mm. Three groups of problems were considered when researching: 1) Selection of the rational geometry

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Automatic Submerged-Arc Welding of Thin Sheets of Different Steels

of the weld (zone of penetration); 2) Establishing of optimum welding conditions; 3) Assessment of results obtained. In Fig 1, the authors give the shape of the weld used when two different sorts of steel are welded. In Table 1, the basic materials used in welding are given. Four kinds of fluxes were tested: AN-348A, FTsL-2, AN-26 and FTsK-M2. Their respective chemical compositions and mechanical properties are given in Tables 2 and 3. The highest value of the weld metal percussion tenacity was obtained when using flux FTsK-M2. As electrode wire, brand EI654 was used; it was established that it ensures an austenitic-ferrite structure of the weld. The results of the research are given in Tables 3 and 4. Fig 5 shows the microstructure of steels 30KhGSA and EI654 outside the heat-affected zone and at the boundary of melting. There are 3 graphs, 6 tables, 1 diagram, 1 photograph and 5 references, 4 of which are Soviet and 1 English.

Card 2/2

ASSOCIATION: Moskovskiy vecherniy mashinostroitel'nyy institut (Moscow Machine-Building Evening Institute)

VLADIMIRSKIY, T.A., doktor tekhn.nauk; VROBLEVSKIY, R.V., inzh.; GLEBOV, L.V., inzh.; GODIN, V.M., kand.tekhn.nauk; GUZOV, S.G., inzh.; GULYAYEV, A.I., inzh.; YERSHOV, L.K., inzh.; KOCHANOVSKIY, N.Ya., kand.tekhn.nauk; LYUBAVSKIY, K.V., prof., doktor tekhn.nauk; PATON, B.Ye., akademik, prof., doktor tekhn. nauk; RABINOVICH, I.Ya., kand.tekhn.nauk; RADASHKOVICH, I.M., inzh.; RYKALIN, N.N., prof., doktor tekhn.nauk; SPEKTOR, O.Sh., inzh.; KHRENOV, K.K., akademik, prof., doktor tekhn.nauk; CHERNYAK, V.S., inzh.; CHULOSHNIKOV, P.L., inzh.; SHORSHOROV, M.Kh., kand.tekhn.nauk; BRATKOVA, O.N., prof., doktor tekhn.nauk, nauchnyy red.; ERINBERG, I.L., kand.tekhn.nauk, nauchnyy red.; GEL'MAN, A.S., prof., doktor tekhn.nauk, nauchnyy red.; KONDRATOVICH, V.M., inzh., nauchnyy red.; KRASOVSKIY, A.I., kand.tekhn.nauk, nauchnyy red.; SKAKUN, G.F., kand.tekhn.nauk; nauchnyy red.; SOKOLOV, Ye.V., inzh., red.; IVANOVA, K.N., inzh., red.izd-va; SOKOLOVA, T.F., tekhn.red.

[Welding handbook] Spravochnik po svarke. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry. Vol.1. 1960. 556 p. (MIRA 14:1)

1. AN USSR (for Paton, Khrenov). 2. Chleny-korrespondenty AN SSSR (for Rykalin, Khrenov).
(Welding--Handbooks, manuals, etc.)

S/135/60/000/001/002/005
A006/A001

18.7200 1506, 1573

AUTHORS: Lyubavskiy, K. V., Professor, Doctor of Technical Sciences, Nikitin, V. M., Candidate of Technical Sciences, Murov, G. F., Engineer

TITLE: Welding in Carbon Dioxide of 30ХГСА (30KhGSA) Steel in Hardened State

PERIODICAL: Svarochnoye proizvodstvo, 1960, No. 1, pp. 4-6

TEXT: The strength of some portions of 30KhGSA steel welds is different due to the presence of hardening and tempering structures. This non-uniformity in the properties of weld joints may be reduced by diminishing the hardness in the hardened section of the zone adjacent to the seam. This can be accomplished by changing the thermal cycle of welding using an additional portable heat source, such as a gas burner moving at a certain distance behind the welding arc. Tests made with a conventional thermal cycle, where the metal in the zone adjacent to the seam was subjected only to the effect of the arc, confirmed V. V. D'yachenko's (Ref. 1) conclusion that the less facorable combination of mechanical properties was observed in the zone of hardening adjacent to the seam

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S/135/60/000/001/002/005
A006/A001

Welding in Carbon Dioxide of 30ХГСА (30KhGSA) Steel in Hardened State

with 500 H_v hardness, at 400 H_v hardness of the base metal, and toughness reduced form 6 to 2.5 kgm/cm^2. N. N. Rykalin's formulae were used to calculate analytically some variants of thermal cycles when welding 2 mm thick 30KhGSA sheet steel hardened to 6 110 - 130 kg/mm^2, using 18ХМА (18KhMA) electrode wire of 1.2 - 1.6 mm in diameter and an additional heat source. The following variants were calculated: 1. After the effect of the arc, the metal in the zone adjacent to the seam is cooled down to 150°C and is then heated by a gas burner flame to 600°C. The cooling curve crosses the line of beginning martensite transformation about 70 seconds after the action of the arc on the metal. The distance between the welding arc and the gas burner at the chosen welding rate (20 m/h) is 700 mm. 2. Heating with the gas burner flame begins before the cooling curve after welding attains the M_o line. [Abstractor's note: Subscript o is the translation from the original n (nachalo = onset) M_n = onset of martensite transformation]. The maximum heating temperature is 600°C, the cooling curve crosses the M_o line 160 sec after the arc's action on the metal. The distance between the arc and the burner is 350 mm. 3. Analogous to variant 2, but differing from it by the use of a supplementary (second) burner arranged at

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Welding in Carbon Dioxide of 30ХГСА (30KhGSA) Steel in Hardened State

350 mm from the first one. The cooling curve crosses the M_o line 250 sec after the arc's effect on the metal. On the basis of data calculated, a laboratory installation was developed, used to reproduce and correct the three variants established. A series of plates were welded and the actual thermal cycles were determined, using chromel-alumel thermocouples switched to an МПО-2 (MPO-2) oscillograph. The comparison of calculated and experimental data showed a satisfactory agreement. The plates welded were subjected to a detailed analysis to reveal the effect of the experimental thermal cycles on the mechanical properties of the weld joints and the magnitude of the zone of the thermal effect. The results of the analysis lead to the following conclusions: All the experimental thermal cycles reduced the hardness of the hardened portion in the zone adjacent to the seam and raised its toughness. Expansion of the zone of thermal effect was not observed in welding by any of the variants. This may be explained by the fact that the temperature of heating the metal with the flame is lower than that of heating with the arc in the same welding area. Variant 3 may be considered as an optimum version of the thermal cycles making it possible to equalize somewhat the mechanical properties of different zones in the weld

Welding in Carbon Dioxide of 30ХГСА (30KhGSA) Steel in Hardened State

metal. This type of cycle increases the ductile properties of the weld joints and reduces the probability of hardening cracking in the welding area. There are 7 figures, 1 table and 2 Soviet references.

ASSOCIATION: Kafedra "Svarochnoye proizvodstvo" MVMI (The Department of "Welding Practice" at MVMI)

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S/125/60/000/007/002/010
A161/A029

AUTHORS: Lyubavskiy, K.V.; Nikitin, Yu.M.

TITLE: Local Destruction of Welds in Austenitic Steam Piping

PERIODICAL: Avtomaticheskaya Svarka, 1960, No. 7, pp. 12 - 25

TEXT: At several Soviet heat power plants pipings and other equipment parts are made of austenitic steel ЭИ257 (EI257) [same steel has also the designation "Х14Н14В2М",(or Kh14N14V2M), or Х18Н12Т (Kh18N12T)]. The welds made by ЦТ-7 (TsT-7) or ЦТ-15 (TsT-15) electrodes have not exactly the same chemical composition as the parent metal due to the formation of recrystallization cracks. In laboratory tests the welds satisfied all property requirements in room and work temperature (580 - 600°C), but in operation they failed partly and sometimes even nearly completely in separate spots where additional stresses could be expected. Cracked welds in one piping system are indicated by circles in the diagram (Fig. 3), and the blackened sectors in the circles show the length of the cracked portion of the pipe circumference; the digits indicate the year in which the cracks had been revealed. Photographs in the article show a circular weld crack (Fig. 4) and radiograms and microphotographs made in experiments undertaken

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Local Destruction of Welds in Austenitic Steam Piping

to investigate the effect of heat cycles on the metal properties. It was stated that the cause of cracking were high residual stresses. Apart from circular cracks in the heat-affected zone at the welds, cracks were revealed also perpendicular to the weld axis and at slight angles. These cracks were 3 - 4 mm below the pipe surface and propagated to a considerable depth. Their orientation suggested considerable tangential residual stresses. Such faults were also found in pipes, which had been stabilized, though here not many cracks were observed. Stabilization at 800°C reduced residual stresses, but their absolute value still was about 9 - 11 kg/mm^2. Such cracks under the pipe surface are difficult to find and therefore particularly dangerous. The conclusion was made that welded pipe joints must be subjected to austenization. The following measures are necessary: a) change of design of the pipelines, particularly the wall thickness and the pipe diameter must be reduced; b) more accurate calculation of stresses in thick-walled pipelines of complex design; c) laboratory methods must be developed for evaluation of the strength of welds. Parallel with these measures, research is necessary for further determination of the destruction causes and preventive measures. There are 15 figures, 3 tables and 15 references: 14 Soviet and 1 English.

ASSOCIATION: Moskovskiy vechernly mashinostroitelnyy institut (Moscow Machine-Building Evening Institute) (K.V. Lyubavskiy); TsNIITMASh (Yu.M. Nikitin)

SUBMITTED: March 8, 1960

AKULOV, A.I.; YEVSEYEV, G.B.; KAGANOV, N.L.; KURKIN, S.A.; LYUBAVSKIY, K.V.; MORDVINTSEVA, A.V.; NAZAROV, S.T.; NIKOLAYEV, G.A., doktor tekhn.nauk, prof., zasluzhennyy deyatel' nauki i tekhniki; OL'SHANSKIY, N.A.; CHANGLI, I.I., red.; STEPANCHENKO, N.S., red. izd-va; EL'KIND, V.D., tekhn.red.

[Current welding practices] Sovremennoe sostoianie svarochnoi tekhniki. Sovmestnoe izdanie Mashgiz, SNTL, 1961. 318 p. (MIRA 14:6)

(Welding)

PALLADIN, A.V., akademik; FEDORCHENKO, I.M., akademik; GULYY, M.F., akademik; BAKULIN, D.I.; MEL'NIKOV, N.P., kand.tekhn.nauk; OKERBLOM, N.O., prof., doktor tekhn.nauk; LYUBAVSKIY, K.V., prof. doktor tekhn.nauk, laureat Stalinskikh premiy; PORTNOY, N.D., kand.tekhn.nauk; TSYBAN', N.G.; KULIKOV, M.S., dotsent; AGRONOMOV, S.N., inzh.; POLYAKOV, V.A., inzh.; SHERSTYUK, V.N., inzh.

Congratulations on the publication of the issue no.100 of the "Avtomaticheskaia Svarka" journal. Avtom.svar. 14 no.7: 3-8 Jl '61. (MIRA 14:7)

1. Prezident AN USSR (for Palladin). 2. AN USSR, glavnyy uchenyy sekretar' AN USSR (for Fedorchenko). 3. AN USSR, predsedatel' redaktsionno-izdatel'skogo soveta AN USSR (for Gulyy). 4. Uchenyy sekretar' AN USSR (for Bakulin). 5. Direktor instituta "Proyektstal'konstruktsiya" (for Mel'nikov). 6. Predsedatel sektsii svarochnogo proizvodstva Tekhniko-ekonomicheskogo soveta Leningradskogo sovnarkhoza (for Okerblom). 7. Glavnyy svarshchik Uralvagonzavoda (for Portnoy). 8. Glavnyy inzh. zavoda im. Nosenko (for TSyban'). 9. Dal'nevostochnyy politekhnicheskiy institut im. V.V.Kuybysheva (for Kulikov). 10. Dal'zavod (for Agronomov, Polyakov). 11. Dal'nevostochnyy nauchno-issledovatel'skiy institut po stroitel'stvu (for Sherstyuk).

(Electric welding--Periodicals)

BR

35620
Z/046/62/000/001/001/007
D007/D102

AUTHOR: Lyubavskiy, Konstantin, V., Professor, Doctor of Sciences

TITLE: Some metallurgical problems in welding heat-resistant steels

PERIODICAL: Zváračský sborník, no. 1, 1962, 3-23

TEXT: This is a review of Soviet papers dealing with the results of research work which has been conducted in the USSR during the past several years in the field of welding heat-resistant austenitic steels. The results are summarized as follows: (1) Weld-metal types, containing in their structure a certain amount of the ferritic phase, have proved reliable in structures designed for long-term service at temperatures up to 650°C. The CT 15 electrode, containing about 19% Cr, 10% Ni and 1% Nb, was found suitable for welding 19%Cr 12%Ni steel. (2) It was found that considerable improvement of the weldability of certain cast heat-resistant steels can be attained by introducing into their structure a certain amount (maximum 5%) of ferrite. A special technology was worked out permitting the control of the ferrite content within a narrow range. (3) Studies aimed at developing electrodes for welding high-austenitic steels showed that electrodes

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Z/046/62/000/001/001/007
D007/D102

Some metallurgical problems ...

having a composition of 15% Cr, 35% Ni, 2% Mo, 2.8% W; or 13% Cr, 15% Ni, 1.6% Nb; or 13% Cr, 18% Ni, 1.6% Nb, 2% W are well suitable for welding these steels. As a result, the new AZh 13-15 and AZh 13-18 electrodes were designed for welding EI694, EI695, and EI695 R steels, respectively. There are 18 figures and 9 tables. (Technical editor: Engineer Š. Horváth, VÚZ Bratislava).

ASSOCIATION: TsNIITMASh, Moscow

Card 2/2

S/135/60/000/007/001/014
A006/A002

AUTHORS: Lyubavskiy, K.V., Professor, Doctor of Technical Sciences, L'vova, Ye.P., Engineer

TITLE: Automatic Welding of "1Kh18N9T" (1Kh18N9T) Steels Under Ceramic "ФЦК" (FTsK) Fluxes

PERIODICAL: Svarochnoye proizvodstvo, 1960, No. 7, pp. 1-5

TEXT: Information is given on the investigation of automatic welding of 1Kh18N9T steel under ceramic FTsK fluxes, including a calculation method to determine the amount of alloying admixtures in the flux ensuring the required ferrite amount in the weld metal. A simplified equation is given to calculate the concentration of the alloying component in multilayer weld joints as a function of the base metal, the electrode wire and the metal admixture of the flux. The coefficient of transition of various components was determined for a series of fluxes with different admixtures of chromium, nickel, and ferroalloys of manganese, molybdenum, titanium and niobium. The fluxes of each series were prepared in two variants: i.e. by mixing in water and sintering at 750°C (FTsK fluxes); and by mixing in water glass of 1.22 density and roasting at 400°C (FTsK-S fluxes). The granulation of the fluxes was 1-2 mm. 1Kh18N9T steel plates were welded under flux with an

Card 1/2

Automatic Welding of "1Х18Н9Т" (1Kh18N9T) Steels Under Ceramic "ФЦК" (FTsK) Fluxes

electrode rod of the same composition and 4 mm in diameter. The welding conditions were: 400-450 amps d.c. of reverse polarity; 30-32 v arc voltage; 35 m/hour welding speed. The arc was fed from a "СГ-1000" (SG-1000) generator. The experimental data were used to calculate the amount of alloying admixtures of the flux. Calculations based on a structural diagram given by Schaeffler (Ref. 5) show that for welding 1Kh18N9T steel with an electrode wire of the same material, it is sufficient to have a set of two fluxes, one of them containing chrome metal or ferro-silicon and one without these admixtures. The use of such fluxes makes it possible to combine the base metal and the electrode in such a manner that weld metals with a two-phase structure and the required ferrite content are obtained. Data given in Table 4, obtained by special experiments, show that weld joints resistant to crystallite corrosion may be produced by slight additional alloying of the welding pool with titanium through the flux. Recommendations are given (Table 5) for automatic butt welding of 2-24 mm thick 1Kh18N9T steel. Experimental tests show that weld joints with satisfactory mechanical properties and resistance against crystallite corrosion may be obtained by the recommended technology. There are 6 tables, 2 figures and 6 references: 4 Soviet and 2 English.

Card 2/2

S/135/62/000/004/016/016
A006/A101

AUTHOR: Lyubavskiy, K. V., Professor, Doctor of Technical Sciences

TITLE: XI International Congress on Welding in Czechoslovakia

PERIODICAL: Svarochnoye proisvodstvo, no. 4, 1962, 45-46

TEXT: Doctor F. Kralik, Engineer P. Dukhay, Candidate of Technical Sciences A. Gavalda, and others reported on results of investigating the effect of the thermal cycle in flash butt-welding on the structure and the mechanical properties of type 16-13[(16-13B) austenite steel, both after welding and aging at 700°C for up to 5,000 hours. Changes in the structure and mechanical properties were compared with the properties of the base metal that was not affected by the thermal cycle of welding. For this purpose an ИМЭТ-1 (IMET-1) type device was designed at the laboratory of physics of the Slovakian Academy of Sciences, for the simulation of thermal cycles. Three thermal cycles with maximum temperatures as high as 900, 1,100 and 1,300°C were studied. The following results were obtained: During the welding cycle, in particular at temperatures over 1,100°C, intensified niobium carbide (NbC) dissolving takes place; at over 1,295°C fusion over the grain boundaries is observed; this entails the formation

Card 1/2

of brittle niobium eutectics at the cooling branch; individual δ-ferrite spots are formed. A thermal cycle with 1,300°C maximum temperature, accelerates the generation of the σ-phase and entails reduced toughness, which is not only due to the σ-phase but also to the presence of niobium eutectics. During the process of aging, no other excessive phases, besides the carbide and σ-phase, were observed. The σ-phase is formed after the effect of thermal cycles T = 900°C and T = 1,100°C, already within 50 hours of aging at 700°C. In metals treated by thermal cycle T = 1,300°C, the σ-phase is formed during the aging process after 20 hours on account of δ-ferrite decomposition. At over 1,150°C, the cleavage is sharply reduced along the grain boundaries. After the completion of the thermal cycle, the metal strength decreases by about 15%. It can be concluded that the final strength and plastic properties of the material in the weld-adjacent zone are, besides the σ-phase, strongly affected by the structure and distribution of niobium carbide. However, the phase transformations investigated cannot explain losses in cohesion along the grain boundaries; therefore the formation and development of cracks in the weld-adjacent zone of this type of steel should be associated with the joint effect of various factors such as: fusion of the grain boundaries; internal stresses; formation of microcracks during cooling; cold and hot brittleness, local formation of eutectics, etc.

[Abstracter's note: This is a complete translation of the excerpt selected]

Card 2/2

36625
G/014/62/000/004/002/006
D030/D109

1.2300

AUTHOR: Lyubavskiy, K.V., Professor, Doctor (Moscow)

TITLE: Welding of austenitic, heat-resistant, noncorrosive, and creep-resistant steels

PERIODICAL: Schweisstechnik, no. 4, 1962, 185

TEXT: The author studied problems in the production of electrodes of various compositions for the welding of above mentioned austenitic steels. The effect of such alloying elements as chromium, molybdenum, cobalt, niobium, tungsten, and vanadium was tested with special attention to the formation of ferrite in the σ-phase. Best results with regard to tensile strength and notch impact strength of the welding material were obtained with niobium. Creep tests also showed the best results with electrodes with niobium addition. Welding of cast austenitic creep-resistant steels was also investigated, with special attention to strain-hardening and heat cracks near the welding seam. The influence of chromium, nickel, and titanium was investigated. Test-welding of various electrodes disclosed that material without ferrite showed cracks in the weld and

adjacent area, while material with a ferrite content of 1 to 5% showed the best results. An increase of the ferrite content up to 10% resulted in numerous cracks in the weld but none in the adjacent area. The USSR is producing steel with a Cr content of 20%, Ni 12%, and Ti 0.5 to 0.8%, which is used at temperatures up to 650°C. Two electrode types developed for the welding of highly austenitic steels for power installations were studied, with special attention to the influence of various elements. Results proved that good properties (no heat cracks) can be obtained.

Card 2/2

LUBAVSKIJ, Konstantin [Lyubavskiy, K.V.], prof., Sc.Dr.

Some problems of the welding of heat resisting steel. Zvar sbor 11 no.1:3-23 '62.

1. Central Scientific Research Institute of Technology and Machinery.

L'VOVA, Ye.P., inzh.; LYUBAVSKIY, K.V., doktor tekhn.nauk, prof.

Electric arc welding of EI725 (Kh15N35B5T) deeply austenitized steel. [Trudy] TSNIITMASH 104:69-80 '62. (MIRA 15:6)
(Steel, Heat-resistant--Welding)

S/135/63/000/003/002/011
A006/A101

AUTHORS: Nikitin, D. G., Engineer, Lyubavskiy, K. V., Professor, Doctor of Technical Sciences

TITLE: The effect of the composition and density of weld metal upon the quality of enamel coatings

PERIODICAL: Svarochnoye proizvodstvo, no. 3, 1963, 4 - 8

TEXT: With the participation of N. A. Dolya and Ya. I. Vol'vach, the Ukrainian Scientific Research Institute of Chemical Machinebuilding carried out an investigation on the causes of defects on enamel coatings on welded joints, and attempted to discover methods improving the quality of welds intended for enamelling. A number of tests were performed to determine the effect of carbon, hydrogen, and titanium upon the quality of the enamel coatings. The thermal enamelling conditions were: rough annealing (840 - 860°C, 30 min); priming annealing (840 - 860°C, 15 min); repeated annealing of two layers of the enamel coating (830 - 850°C, 15 min). Cylindrical and disk-shaped specimens were used. The effect of titanium in the weld metal upon the permeability of hydrogen and

Card 1/3

The effect of the composition and...

the formation of defects in the enamel coating was studied with the aid of glass cylinders filled with a 0.1 N H_2SO_4 solution and a glass funnel containing glycerin. The electrolytical process in the cylinder was accompanied by the separation of hydrogen on the cathode (the specimen under investigation). The hydrogen diffuses through the disk metal and is separated out on the surface; it expells the glycerin, which is weighed after 72 hours. From the glycerin weight the amount of diffused hydrogen is calculated. The following results are obtained. The formation of enamel defects depends considerably upon the composition and density of the weld metal. The main cause for the development of enamel defects is the separation of gases on the enamel-metal interface. The quality of enamel coatings on weld joints can be improved by introducing titanium to the enamelled metal. This positive effect of titanium is apparently due to a higher purity and density of the metal, resulting from the effective deoxidation of the metal and partial or full neutralization of the harmful effect of carbon. This is due to the formation of stable Ti carbides, which are not dissociated during enamelling. The positive effect of Ti is also due to the inhibited hydrogen diffusion in titaneous metal as a result of its increased density and the formation of titanium hydrides. The industrial use of electrodes, alloying the weld metal

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with Ti in amounts from 0.25 - 0.45%, in welding 08 steel equipment for enamelling confirmed the positive effect of this element on the quality of enamel coatings on welded joint. As a result the yearly efficiency of enamelled articles has sharply increased. There are 6 tables and 7 figures.

ASSOCIATIONS: UkrNIIKhIMMASh (Nikitin), TsNIITMASh (Lyubavskiy)

(1)

L 17349-63 EWP(k)/EWP(q)/EWT(m)/BDS AFFTC Pf-4 JD/HM
ACCESSION NR: AP3006477 S/0135/63/000/009/0004/0007

64

AUTHOR: Lyubavskiy, K. V. (Dr. of technical sciences, Prof.); Smirnov, A. G. (Engineer); Antonov, Ye. G. (Engineer); Yakovlev, V. A. (Cand. of technical sciences); Dubrovskiy, S. M. (Engineer); Ly*kova, Z. V. (Engineer)

TITLE: Automatic welding of 25KhSNVFA steel with induction post-heating

SOURCE: Svarochnoye proizvodstvo, no. 9, 1963, 4-7

TOPIC TAGS: high strength pearlitic 25KhSNVFA steel, carbon dioxide shielded automatic welding, automatic submerged arc welding, weld metal ductility, weld metal strength, weld metal notch toughness, weld metal microstructure, induction postheating, postheating effect, combined welding postheating unit, high pressure vessel welding

ABSTRACT: Heat-treated (hardened and tempered) 25KhSNVFA pearlitic high-strength steel [0.23—0.25% C; 0.5—0.8% Mn; 0.9—1.2% each of

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L 17349-63

ACCESSION NR: AP3006477 O

Si, Cr, and Ni; 0.5—1.0% W, 0.05—0.15% V] sheets were welded with a carbon dioxide shielded arc and Sv-08G2S electrode wire without backup. Annealed plates 6 mm thick were submerged-arc-welded with 20KhSNVFA electrode wire and AN-15 flux [23.5% SiO_2, 21.0% Al_2O_3, 1.0% Fe_2O_3, 14.0% CaO, 9.3% MgO, 2.7% MnO, 21.3% CaF_2, 0.03% P, 0.03% S] using a copper backup plate. All welds were single-pass square-butt welds. Induction postheating was applied with an induction heater rigidly attached to the welding head at a distance of 350 or 500 mm. This distance was found experimentally and determined the weld temperature at which postheating was applied — 620K, about 20K higher than the M_s point. The heater length, 300 or 450 mm, determined duration of heating, 60 or 90 sec; the postheating temperature was 770—920K for heat-treated steel welds and 970K for annealed steel welds. It was found that in welding hardened or annealed steel, the induction postheating significantly increased the ductility of the weld metal without decreasing the strength of the joint. For example, the tensile strength of the postheated joints of heat-treated 25KhSNVFA steel plates welded with a CO_2 shielded arc varied between 112 and 120 kg/mm^2, the

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ACCESSION NR: AP3006477

bend angle, between 50 and 82°, and the notch toughness, between 5 and 6 mkg/cm^2, compared to 117—121 kg/mm^2, 44—52°, and 3.4—4.2 mkg/cm^2 for welds not postheated. The induction-heated zone adjacent to the weld consisted of martensite, bainite, and pearlite instead of the coarse acicular martensite formed in welds without postheating. This technique has been successfully employed to fabricate industrial high-pressure vessels from 25KhSNVFA steel. The vessels consisted of three cylindrical shells with a wall thickness of 6 mm and two hemispherical end closures formed of 8 mm-thick plate welded to the cylindrical portion. The closures had welded-in central pipe connections. All welds were made with a submerged arc from both sides using 20KhSNVFA filler wire and AN-15 flux. Separate welding units with induction heaters fed by a current at 2500 cps were used for making the longitudinal, circumferential, and circular welds. Orig. art. has: 9 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 00	DATE ACQ: 30Sep63	ENCL: 00
SUB CODE: MA	NO REF SOV: 002	OTHER: 000

Card 3/3

YARAVINSKIY, L. M.; LYUBAVSKIY, K. V.; TIMOFEYEV, M. M.; BAZHENOV, V. V.

"Le soudage des aciers austenitiques et perlitiques resistant a haute temperature dans les centrales d'energie."

report submitted for 17th Annual Assembly, Intl Inst of Welding, Prague, Jul 64.

NIKITIN, D.G., inzh.; LYUBAVSKIY, K.V., doktor tekhn.nauk

Alloying the joint metal with titanium during arc welding for subsequent enameling. Svar.proizv. no.2:3-6 F '64.
(MIRA 18:1)

1. Ukrainskiy nauchno-issledovatel'skiy institut khimicheskogo mashinostroyeniya (for Nikitin). 2. TSentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya (for Lyubavskiy).

L 11016-65 EWT(r)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(b) Pf-4 AFETR/ASD(m)-3
MJW/JD/HM

ACCESSION NR: AP4047011 S/0135/64/000/010/0006/0009

AUTHOR: Lyubavskiy, K. V. (Doctor of technical sciences); Bad'yanov, B. N. (Engineer); Klestova, Z. D. (Engineer) B

TITLE: Selection of flux for [submerged-arc] welding of a super-strength steel 18

SOURCE: Svarochnoye proizvodstvo, no. 10, 1964, 6-9

TOPIC TAGS: superstrength steel, superstrength steel welding, submerged arc welding, submerged arc welding flux, superstrength steel weld, weld property

ABSTRACT: Several fluxes have been tested in submerged-arc welding of the 25KhSNVFA superstrength steel. The most satisfactory results were obtained with the experimental oxygen-free AV-4 flux. This flux was found to be the least active, and the loss of alloying elements was insignificant, lower than in argon shielded-arc welding. The oxygen content of the weld was lower than that of the base metal. The content of nonmetallic inclusions was comparable to that in argon-shielded arc welding. The weld metal deposited with the 20KhSNVFA electrode

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L 11016-65
ACCESSION NR: AP4047011

wire, and AV-4 flux had a tensile strength of 101.0—105.0 kg/mm^2, about the same as that of the weld metal deposited with other fluxes or with an argon-shielded arc, but the ductility characteristics of the former were considerably higher: elongation, 18—20%; reduction of area, 48.0—57.5%; and notch toughness, 7.4—10.2 mkg/cm^2. Heat treatment which brought the strength of the base metal to a level of 120—140 kg/mm^2 raised the strength of the weld metal to 117.5—157.2 kg/mm^2 and the yield strength to 111.4—146.4, at an elongation of 6.0—7.5%, a reduction of area of 43.2—58.1%, and a notch toughness of 8.4—11.3 or 5.4—8.0 mkg/cm^2 at room temperature and -78C, respectively. Orig. art. has: 7 tables and 5 figures.

ASSOCIATION: none

SUBMITTED: 00	ENCL: 00	SUB CODE: MM
NO REF SOV: 010	OTHER: 001	ATD PRESS: 3133

Card 2/2

LYUBAVSKIY, K.V., doktor tekhn.nauk; ANTONOV, I.A., kand.tekhn.nauk

The 17th Congress of the International Welding Institute. Svar.proizv. no.11:43 N '64. (MIRA 18:1)

L 4361d-65 EPF(c)/EPR/EWG(j)/EPA(s)-2/EWP(k)/EWP(z)/EWA(c)/EWT(d)/EWT(m)/EWP(h)/EWP(b)/T/EWA(d)/EWP(l)/EWP(w)/EWP(v)/EWP(t) Pf-4/Pr-4/Ps-4 IJP(c) JD/HM/HW/GS

ACCESSION NR: AT5006306 S/0000/64/000/000/0225/0246

AUTHOR: Lyubavskiy, K.V. (Doctor of technical sciences); Kikitin, Yu. M. (Candidate of technical sciences)

TITLE: Effect of the thermal welding cycle on the properties of austenitic heat resistant steels

SOURCE: AN UkrSSR. Institut elektrosvarki. Novyye problemy svarochnoy tekhniki (New problems in welding technology). Kiev. Izd-vo Tekhnika, 1964, 225-246

TOPIC TAGS: welding, austenitic steel, steel welding, heat resistant steel, welding temperature, steel mechanical property, weld seam strength, electroslag welding

ABSTRACT: This paper is a continuation of one published by the authors in 1960. The paper considers the effect of welding conditions on local failure of weld joints. The IMET-1 machine was used for testing. Deviations at the maximum temperature of 1340C were ±20C. The tests registered the change in overall strength, plasticity, strength at 580-610C, and strength of round samples. Twelve different melts of 1Kh14N14V2M and 1Kh18N12T steel were tested. The results indicated that cracks are formed in both materials (at the seam); they have a wide, high temperature interval of brittleness and a lower level of strength while cooling. It was also found that both materials show similar changes in strength and plasticity at the weld joint under the influence of heat. The sensitivity of the

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L 43618-65

ACCESSION NR: AT5008306

steel depends on its natural features (composition and metallurgical processes). Metallographic analysis showed that at welding temperatures above 1200C the grain boundaries are melted, leading to incomplete restoration of strength and plasticity. Close to these melted grains, microfractures are formed due to variable stress caused by vacancies. Concentration of these vacancies into pores is a factor aiding the formation of microfractures. The relatively higher content of oxygen and sulfur causes local fractures, so that decreasing these inclusions decreases the defects. Electroslag welding is a positive factor in this respect. Tests were made with samples of large cross section to investigate the effect of welding on short-term and long-term strength. The same grades of steel were used for these tests. Metallographic analysis showed that short-term fractures were transcrystallized. In other words, the strength and plasticity of the metal was determined by the grain material. Prior to the tests, the steel was heated to the solidus temperature and then cooled under tensile stress, leading to loosening of the metal by vacancies and dislocations. Further treatment for forming an austenitic steel at 950-1100C could not improve the quality of the metal. The trans-crystalline grains were hardened, causing the above-mentioned type of fracture. The tests performed indicated that it is impossible to estimate the effect of welding on the strength of weld joints by short-term strength studies. The paper also describes other tests on austenitic steel after welding, as well as of pipes. The presence of inclusions

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L 43618-65
ACCESSION NR: AT5008306

3

consistently lowered the strength of the metal near the weldjoint. Metals with coarse grains have lower strength than those with fine ones. "Tests were performed under the guidance of Candidate of Technical Sciences M.M. Timofeyev, while Engineer B.I. Morozov participated in the experimental work." Orig. art. has: 22 figures and 7 tables.

ASSOCIATION: TsNIITMash

SUBMITTED: 05Nov64 ENCL: 00 SUB CODE: IE, MM

NO REF SOV: 009 OTHER: 000

Card 3/3 CC

L 40290-65 EWT(d)/EPA(s)-2/EWT(m)/EWP(c)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(h)/EWP(b)/EWP(l)/EWA(c) Pf-4 JD/HW

ACCESSION NR: AP5002885 S/0135/65/000/001/0013/0017

30
28
B

AUTHOR: Smirnov, A. G. (Engineer); Lyubavskiy, K. V. (Doctor of technical sciences)

TITLE: Modeling of thermal welding cycles

SOURCE: Svarochnoye proizvodstvo, no. 1, 1965, 13-17

TOPIC TAGS: welding, thermal welding cycle, thermal cycle modeling, weld testing, weld strength

ABSTRACT: After discussing various drawbacks of the existing methods for testing the reaction of metals to thermal cycles (cylindrical sample method, IMET-1 machine method (M. Kh. Shorshorov, G. N. Klebanov, VINITI, No. M-57-134/12, 1957), modified IMET-I method (K. V. Lyubavskiy, Yu. M. Nikitin, Avtomaticheskaya svarka, 1960, no. 7), and the micromechanical method (I. M. Roytman, Ya. B. Fridman, Mikromekhanicheskiy metod ispytaniya metallov, Oborongiz, 1950)), the authors propose a new method in which models are electrically heated according to given thermal cycles. Samples are subsequently cut from the models and subjected to mechanical testing. Samples were heated by means of the standard welding machine MTP-75 coupled to the PIT-50 interrupter which can handle a wide range of sample shapes. Re-

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L 40290-65
ACCESSION NR: AP5002885

2

sults from modeling samples agreed very well with data from the cut of an actual welding joint. "N. I. Nikolayev and N. P. Zenin participated in the development of the method." Orig. art. has: 9 figures and 1 table.

ASSOCIATION: None

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NO REF SOV: 004 OTHER: 000

DC

Card 2/2

LYUBAVSKIY, K.V., doktor tekhn. nauk

Conference on crystallization processes and structural transformations in welded joints in connection with their improvement. Svar. proizv. no.2:44-45 F '65.
(MIRA 18:3)

L 34082-65 EPA(s)-2/EWP(k)/EWA(c)/EWT(m)/EWP(b)/T/EWA(d)/EWP(v)/EWP(t) pf-4
MJW/JD/HM/HM

ACCESSION NR: AP5007335 S/0135/65/000/003/0008/0011

35
31
6

AUTHOR: Lyubavskiy, K. V. (Doctor of technical sciences); Morozov, B. I. (Engineer); Nikitin, Yu. M. (Candidate of technical sciences); Timofeyev, M. M. (Candidate of technical sciences)

TITLE: The effect of non-uniformity in the strength characteristics of welded joint on their tendency toward local breakdown

SOURCE: Svarochnoye proizvodstvo, no. 3, 1965, 8-11

TOPIC TAGS: weld breakdown, weld seam strength, austenitic steel, steel welding, high temperature strength, bending strength, residual stress / 1kh18N12T steel, 1kh14M14V2M steel

ABSTRACT: This article reports the results of a study of the effect of lack of uniformity in the strength characteristics in different weld zones on the propensity of these welded joints toward local breakdown at high temperatures. The steels used in the tests were types 1Kh18N12T and 1Kh14N14V2M. Electrodes, providing for different degrees of alloying of the welted metal, were employed to measure the level of the strength characteristics. Samples of two types were studied, thus making it possible to estimate the effect of residual weld stresses and stresses developing when the welds are subjected to twisting on the tendency of such joints

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L 34082-65

ACCESSION NR: AP5007335

toward localized failure when there are non-uniform strength properties present in the "base metal - weld metal" zone. These samples, and the method of their preparation, are described in some detail in the article. The breakdown tendency was studied both under conditions of slowly relaxing residual weld stresses and torque moments. The authors show that as the non-uniformity in strength properties in the various zones of the weld joint is increased, the working capacity of the weld decreases under the conditions described above. Specifically, the possibility of local breakdowns in austenitic steel welds under the influence of slowly relaxing residual weld stresses is confirmed. An increase in the strength characteristics in the seam metal and, correspondingly, in the residual stress level in the weld leads to accelerated local failure in the zone around the seam at high temperatures. Of the two austenitic steel types tested, type 1Kh18N12T shows a more marked tendency toward such breakdown throughout this zone under the influence of weld stresses. The authors also demonstrate the considerable effect of non-uniformity in the strength and plastic properties of the joint on its propensity toward local breakdown when subjected to torque forces. It is found that high-temperature austerization (1100 C) of the weld joint, equalizing the strength characteristics and sharply reducing the level of residual weld stresses, promotes enhanced operational reliability in welded joints under actual working conditions. "Bending

Card 2/3

L 34082-65

ACCESSION NR: AP5007335

3

tests at a constant rate of strain were carried out at TskTI under the guidance of Dr. Tech. Sci. V. N. Zemzin." Orig. art. has: 4 tables and 5 figures.

ASSOCIATION: TsNIITMASh

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NO REF SOV: 004 OTHER: 000

Card 3/3

L 50332-65 EPA(s)-2/EWT(m)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(c)
Pf-4 MJW/JD/HM
ACCESSION NR: AP5012640 UR/0135/65/000/005/0005/0008 25 28

AUTHOR: Smirnov, A. G. (Engineer); Lyubavskiy, K. V. (Doctor of technical sciences)

TITLE: Investigation of the heat-affected zone in the 25KhSNVFA and VL-1D steels 18 15

SOURCE: Svarochnoye proizvodstvo, no. 5, 1965, 5-8 4 16

TOPIC TAGS: complex alloy steel, high strength structural steel, steel welding, steel weld, weld zone, zone property, heat affected zone/25KhSNVFA steel, VL 1D steel

ABSTRACT: The effect of welding on the mechanical properties of the heat-affected zone of 25KhSNVFA (0.27% C, 0.57% Mn, 1.12% Si, 1.05% Cr, 1.03% Ni, 0.82% W, 0.15% V, 0.17% Cu) and VL-1D (0.32% C, 1.10% Mn, 1.03% Si, 1.63% Cr, 1.18% Ni, 1.17% W, 0.42% Mo) steel have been investigated. The steels were subjected to heat treatment under conditions imitating those which occur in automatic CO_2 shielded arc welding: heating to 400—1350C at a rate varying from 25 to 800 C/sec, and cooling at rates determined for different points of the heat-affected zone of a real welded joint. The room-temperature properties of 25KhSNVFA steel were not affected by rapid heating to 500C, whereas the properties of VL-1D steel deteriorated with heating to 400C. Thermal cycles with heating to 500—750C progres-

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sively decreased the strength and increased the ductility of hardened and tempered steels. In annealed steels, the changes in properties were insignificant. The weakened metal zone was 4 mm from the fusion line and was 3—4 mm wide. Thermal cycles with heating above 750C increased the strength and decreased the ductility of both steels, not only near the weld, but also in the region of partial austenization. Under conditions of the welding cycle, the austenitic transformation in both steels occurred at appreciably higher temperatures than under conditions of furnace heat treatment. The coarse ferritic-pearlitic structure transformed at higher temperatures than did the fine-grained sorbite structure. The ferritic-pearlitic structure of the VL-1D steel transforms completely at a higher temperature than that of 25KhSNVFA, probably because of a higher alloying of the former. In annealed 25KhSNVFA steel, the welding cycles with heating to 910—1300C produce roughly the same amount of residual austenite. Orig. art. has: 4 figures and 3 tables. [MS]

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NO REF SOV: 006 OTHER: 000 ATD PRESS: 4006

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L 2130-66 EWT(m)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(c) MJW/JD/HM
ACC NR: AP5022344 SOURCE CODE: UR/0135/65/000/009/0001/0005

AUTHOR: Smirnov, A. G. (Engineer); Lyubavskiy, K. V. (Doctor of technical sciences)

ORG: none

TITLE: Post-heating in welding of 25KhSNFVA steel

SOURCE: Svarochnoye proizvodstvo, no. 9, 1965, 1-5

TOPIC TAGS: super strength steel, steel welding, automatic welding, weld heat treatment, weld metal property/25KhSNVFA steel

ABSTRACT: Experiments have been made to determine the optimum conditions for welding hardenable steels, specifically 25KhSNVFA steel, which would ensure the best combination of mechanical properties and prevent cold cracking. The experiments consisted of simulating the heat cycles which occur in the weld and heat-affected zone of 25KhSNVFA steel sheets (2.2 mm thick) during automatic CO_2 shielded-arc welding. Specimens were rapidly cooled to 20—450C and then reheated to 400 or 600C, held at these temperatures for 75—180 sec, and air cooled. The best results were obtained with onset of heating at 400C and maintaining this temperature for 120 sec. The initial condition of the steel structure (annealed or hardened and tempered) had no effect on the properties of the heat-affected zone of 25KhSNVFA steel. In actual welding of hardened and tempered 25KhSNVFA steel, the metal in the heat-affected zone had a tensile strength of about 125 kg/mm^2, a bend angle of 120 deg, an elongation of 11%, a notch toughness of

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L 2130-66
ACC NR: AP5022344

about 7.5 kgm/cm^2, and a cyclic strength of $3.6 \cdot 10^3$ cycles at a stress of 87.5 kg/mm^2. Post-heating, in which isothermal holding takes place at 500—700C, lowered the ductility of the 25KhSNVFA steel in the heat-affected zone. Orig. art. has: 8 figures. [MS]

SUB CODE: MM,IE/ SUB DATE: 00 / ORIG REF: 004/ OTH REF: 000/ ATD PRESS: 4122

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L 3269-66 EWT(m)/ETC/ENG(m)/EWP(v)/EPA(w)-2/T/EWP(t)/EWP(k)/EWP(b)/EWA(c) DS/JD/
ACC NR: AP5025608 HM/HW

UR/0135/65/000/010/0009/0012
621.791.75.01:538.122

AUTHOR: Levakov, V. S. (Engineer); Lyubavskiy, K. V. (Doctor of technical sciences)

TITLE: Effect of longitudinal magnetic field on an electric arc with a nonconsumable tungsten cathode

SOURCE: Svarochnoye proizvodstvo, no. 10, 1965, 9-12

TOPIC TAGS: arc welding, longitudinal magnetic field, magnetic field intensity, welding electrode, electric arc

ABSTRACT: The authors investigated the effect of a longitudinal -- parallel to the electrode axis -- magnetic field on the shape and stability of an electric arc burning in an argon atmosphere with a nonconsumable tungsten electrode serving as the cathode, with the object of determining the suitability of this arc as a heat source for welding small-diameter tubes to tubular frames. It is shown that the a) following characteristic types of arc may arise in the longitudinal magnetic field: arc rotating about its axis and having a shape analogous to that of the arc without a superposed magnetic field; b) cone-shaped arc with a discharge column shaped like a regular hollow cone; and c) unstable arc with unstable shape. The conic arc shape is of the greatest practical interest, particularly as regards the welding of small-diameter tubes, since it represents the stable formation of plasma in the form of a

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ACC NR: AP5025608

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homogeneous cone-shaped layer. The diagram in Fig. 1 of the Enclosure, showing the different arc types (and the boundary conditions for their stable states) as a function of the intensity of the magnetic field, makes it possible to select the regimes of specified arc types. This plot is constructed for an anode orifice diameter of 5mm, and its comparison with similar plots for other orifice diameters leads to the following conclusions: As the anode orifice diameter increases, region II (arcs rotating about their axis) shifts to the left, by ~25 a per mm of diameter; at the same time, region III (unstable arcs with unstable shape) shifts sharply to the right (for a 10 mm diameter the current is 220 a), while the region of cone-shaped arcs (I) shrinks and is displaced in the upper-right direction. As the diameter decreases, the region of the cone-shaped arcs expands and, over a broad range of current values, the lower limit of the magnetic-field intensity applying to these arcs is 230-235 oe. Orig. art. has: 9 figures.

ASSOCIATION: TsNIITMASh 44,55

SUBMITTED: 00 ENCL: 01 SUB CODE: EM, IE

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ACC NR: AP5025608

ENCLOSURE: 01

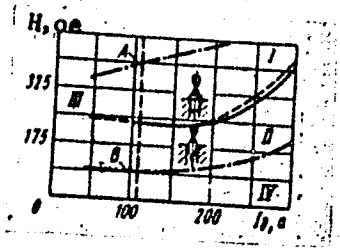

Fig. 1. Diagram of different arc types in a longitudinal magnetic field

(d_{0a} = 5 mm, t_{∂} = 4 mm)

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L 9677-66 EWT(m)/EWP(v)/T/EWP(t)/EWP(k)/EWP(b)/EWA(c) JD/HM

ACC NR: AP5027605 SOURCE CODE: UR/0135/65/000/011/0034/0035

AUTHOR: Levakov, V. S. (Engineer); Lyubavskiy, K. V. (Doctor of technical sciences)

ORG: none

TITLE: Cone arc welding of tube banks

SOURCE: Svarochnoye proizvodstvo, no. 11, 1965, 34-35

TOPIC TAGS: arc welding, magnetic field, metal tube, heat exchanger, seam welding

ABSTRACT: The cone arc forms under the action of a longitudinal magnetic field of at least 230 oe and has the shape of a uniformly tapering cone with a base represented by a ring-shaped anode spot with uniform current density throughoutits perimeter, assuring uniform quality of the weld. The regime of cone arc welding is selected in accordance with the tube diameter. The welding procedure is illustrated in Fig. 1. The magnetic field is generated by a DC-fed coil slipped over a ferromagnetic core (burner nozzle). Such a system, designed for 3600 ampere-turns, assures a uniform longitudinal field with an intensity of up to 500 oe in the space occupied by the arc. The welding cycle involves the following sequence of operations: a) blowdown of burner-nozzle with argon (0.5-1 sec), energization of the magnetic-field coil; b) excitation of arc by an oscillator; c) welding (for 0.5-1.5 sec depending on tube dimensions); d) final argon-blowdown (1-1.5 sec) of the crystallizing and cooling seam. The cone

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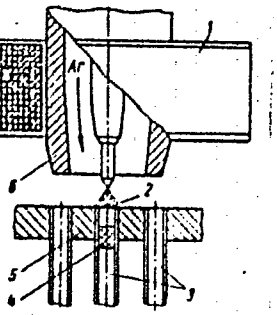

Fig. 1. Cone arc welding of tube banks.

1 - coil generating the magnetic field; 2 - cone arc;
3 - tube; 4 - removable asbestos plug; 5 - tube board;
6 - housing